

SEQUENCE LISTING

<110> Genencor International, Inc.
Weyler, Walter
Hsu, Amy Kuang-Hua

<120> pckA Modifications and Enhanced Protein Expression in Bacillus

<130> GC836-PCT

<140> PCT/US2005/011821

<141> 2005-04-07

<150> US 60/561,110

<151> 2004-04-09

<160> 205

<170> PatentIn version 3.2

<210> 1

<211> 129

<212> DNA

<213> Bacillus subtilis

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<211> 43

<212> PRT

<213> Bacillus subtilis

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<212> DNA

<213> Bacillus subtilis

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aatccgtccg	ttcaattttt	aaaaaaagtt	tctgccacac	tggaagttga	attaacagaa	180
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gtacatttag	tgcaagccgt	acaagccggg	atggaaaagg	aagaattggt	cacttttacg	300
aacagactca	agaaagaaca	gcctgaaact	gcctcttacc	gcaaccgcaa	actgacggaa	360
tccaatatag	aagaatggaa	agcgctgatg	gcggaggcaa	gagaaatcgg	cttgtctgtc	420
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 <213> Bacillus subtilis

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 20 25 30
 Lys Ile Glu Arg Gly Val His Thr Asn Pro Ser Val Gln Phe Leu Lys
 35 40 45
 Lys Val Ser Ala Thr Leu Glu Val Glu Leu Thr Glu Leu Phe Asp Ala
 50 55 60
 Glu Thr Met Met Tyr Glu Lys Ile Ser Gly Gly Glu Glu Glu Trp Arg
 65 70 75 80
 Val His Leu Val Gln Ala Val Gln Ala Gly Met Glu Lys Glu Glu Leu
 85 90 95
 Phe Thr Phe Thr Asn Arg Leu Lys Lys Glu Gln Pro Glu Thr Ala Ser
 100 105 110
 Tyr Arg Asn Arg Lys Leu Thr Glu Ser Asn Ile Glu Glu Trp Lys Ala
 115 120 125
 Leu Met Ala Glu Ala Arg Glu Ile Gly Leu Ser Val His Glu Val Lys
 130 135 140
 Ser Phe Leu Lys Thr Lys Gly Arg
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<210> 5
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 <212> DNA
 <213> Bacillus subtilis

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<210> 6
 <211> 55
 <212> PRT
 <213> Bacillus subtilis

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 Met Lys Pro Gly Gly Thr Ser Ile Val Lys Ala Ala Gly Cys Met Gly
 20 25 30
 Cys Trp Ala Ser Lys Ser Ile Ala Met Thr Arg Val Cys Ala Leu Pro
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 His Pro Ala Met Arg Ala Ile
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<210> 7
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 <212> DNA
 <213> Bacillus subtilis

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gatcaaaagc gccggggcga acagctgaca agtatctttg aaaacggcac aacggagatc 180
caatatggat atgtagagcg attggatgac gggcgaggct atacatgcgg acgggcaggc 240
tttacaacgg ctaccgggga tgcattggaa gtagtggaa gtagtggaa tatacacaaa ggcagttccg 300
aataacaaac tgaaaaagta tctgcctgaa ttgcgcgcgc tggccaagga agaaagcgat 360
gatacaagca atctcaaggg attcgcttct gcctggaagt cgcttgcaaa tgataaggaa 420
tttcgcgcgc ctcaagacaa agtaaatgac catttgtatt atcagcctgc catgaaacga 480
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gaatcagttg cccgtgtgga cgtgcttcgc tctatcgcca aggagaacaa ctataatcta 780
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<213> Bacillus subtilis

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35 40 45
Leu Thr Ser Ile Phe Glu Asn Gly Thr Thr Glu Ile Gln Tyr Gly Tyr
50 55 60
Val Glu Arg Leu Asp Asp Gly Arg Gly Tyr Thr Cys Gly Arg Ala Gly
65 70 75 80
Phe Thr Thr Ala Thr Gly Asp Ala Leu Glu Val Val Glu Val Tyr Thr
85 90 95
Lys Ala Val Pro Asn Asn Lys Leu Lys Lys Tyr Leu Pro Glu Leu Arg
100 105 110
Arg Leu Ala Lys Glu Glu Ser Asp Asp Thr Ser Asn Leu Lys Gly Phe
115 120 125
Ala Ser Ala Trp Lys Ser Leu Ala Asn Asp Lys Glu Phe Arg Ala Ala
130 135 140
Gln Asp Lys Val Asn Asp His Leu Tyr Tyr Gln Pro Ala Met Lys Arg
145 150 155 160
Ser Asp Asn Ala Gly Leu Lys Thr Ala Leu Ala Arg Ala Val Met Tyr
165 170 175
Asp Thr Val Ile Gln His Gly Asp Gly Asp Asp Pro Asp Ser Phe Tyr
180 185 190
Ala Leu Ile Lys Arg Thr Asn Lys Lys Ala Gly Gly Ser Pro Lys Asp
195 200 205
Gly Ile Asp Glu Lys Lys Trp Leu Asn Lys Phe Leu Asp Val Arg Tyr
210 215 220
Asp Asp Leu Met Asn Pro Ala Asn His Asp Thr Arg Asp Glu Trp Arg
225 230 235 240
Glu Ser Val Ala Arg Val Asp Val Leu Arg Ser Ile Ala Lys Glu Asn
245 250 255
Asn Tyr Asn Leu Asn Gly Pro Ile His Val Arg Ser Asn Glu Tyr Gly
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Asn Phe Val Ile Lys
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<210> 9
<211> 792
<212> DNA
<213> *Bacillus subtilis*

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acaaatctgg ttgacatgct tgcgaaaaaa tactcaaaag gcaaaagctt ccacgaggat 180
ctccgccagg tcggcatgat cgggctgcta ggcgcgatta agcgatacga tcctgttgtc 240
ggcaaatcgt ttgaagcttt tgcaatcccg acaatcatcg gtgaaattaa acgtttcctc 300
agagataaaa catggagcgt tcatgtgccg agacgaatta aagaactcgg tccaagaatc 360
aaaatggcgg ttgatcagct gaccactgaa acacaaagat cgccgaaagt cgaagagatt 420
gccgaattcc tcgatgtttc tgaagaagag gttcttgaaa cgatggaaat gggcaaaagc 480
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attcttgata tcgtcggatc acaggaggac ggatatgagc gggtaacca gcaattgatg 600
ctgcaaagcg tgcttcatgt cttttcagac cgtgagaaac aaatcataga ctttacgtat 660
attcaaaaca aaagccaaaa agaaactggg gacattctcg gtatatctca aatgcacgtc 720
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<210> 10
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<212> PRT
<213> *Bacillus subtilis*

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35 40 45
Lys Lys Tyr Ser Lys Gly Lys Ser Phe His Glu Asp Leu Arg Gln Val
50 55 60
Gly Met Ile Gly Leu Leu Gly Ala Ile Lys Arg Tyr Asp Pro Val Val
65 70 75 80
Gly Lys Ser Phe Glu Ala Phe Ala Ile Pro Thr Ile Ile Gly Glu Ile
85 90 95
Lys Arg Phe Leu Arg Asp Lys Thr Trp Ser Val His Val Pro Arg Arg
100 105 110
Ile Lys Glu Leu Gly Pro Arg Ile Lys Met Ala Val Asp Gln Leu Thr
115 120 125
Thr Glu Thr Gln Arg Ser Pro Lys Val Glu Glu Ile Ala Glu Phe Leu
130 135 140
Asp Val Ser Glu Glu Glu Val Leu Glu Thr Met Glu Met Gly Lys Ser
145 150 155 160
Tyr Gln Ala Leu Ser Val Asp His Ser Ile Glu Ala Asp Ser Asp Gly
165 170 175
Ser Thr Val Thr Ile Leu Asp Ile Val Gly Ser Gln Glu Asp Gly Tyr
180 185 190
Glu Arg Val Asn Gln Gln Leu Met Leu Gln Ser Val Leu His Val Leu
195 200 205
Ser Asp Arg Glu Lys Gln Ile Ile Asp Leu Thr Tyr Ile Gln Asn Lys

210	215	220
Ser Gln Lys Glu Thr Gly Asp Ile Leu Gly Ile Ser Gln Met His Val		
225	230	235
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	245	250
Glu Asp Pro Ser Met Glu Leu Met		255
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 <212> DNA
 <213> Bacillus subtilis

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 tggatattgc tgtttgttct gggcgctatg gtatactgga catatgagcc cacttcccta 180
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 gaaattcttg aagaaaacaa cgaaatgctc cacatgtatc tcaatcggct gaaaacatac 360
 caatacctat tgaaaaacga accgatccat gtttattatg gaagtataga tgcttatgct 420
 gaaggtattg ataagctgct gaaaacctat gctgataaaa tgaacttaac ggcttctctt 480
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 gtcacggaat ttgattattt gctattttacg tcattaacga gcatatatga tttggtgctg 720
 ccaattgagg aggaaggtga agga 744

<210> 12
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 <212> PRT
 <213> Bacillus subtilis

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 35 40 45
 Ala Met Val Tyr Trp Thr Tyr Glu Pro Thr Ser Leu Phe Thr His Trp
 50 55 60
 Glu Arg Tyr Leu Ile Val Ala Val Ser Phe Ala Leu Ile Asp Ala Phe
 65 70 75 80
 Ile Phe Leu Ser Ala Tyr Val Lys Lys Leu Ala Gly Ser Glu Leu Glu
 85 90 95
 Thr Asp Thr Arg Glu Ile Leu Glu Glu Asn Asn Glu Met Leu His Met
 100 105 110
 Tyr Leu Asn Arg Leu Lys Thr Tyr Gln Tyr Leu Leu Lys Asn Glu Pro
 115 120 125
 Ile His Val Tyr Tyr Gly Ser Ile Asp Ala Tyr Ala Glu Gly Ile Asp
 130 135 140
 Lys Leu Leu Lys Thr Tyr Ala Asp Lys Met Asn Leu Thr Ala Ser Leu
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 Cys His Tyr Ser Thr Gln Ala Asp Lys Asp Arg Leu Thr Glu His Met
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 Asp Asp Pro Ala Asp Val Gln Thr Arg Leu Asp Arg Lys Asp Val Tyr

<210> 16
 <211> 378
 <212> PRT
 <213> Bacillus subtilis

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 35 40 45
 Gln Asp Leu Leu Leu Tyr Tyr Ser Leu Met Glu Phe Arg His Arg Val
 50 55 60
 Met Leu Asp Tyr Ile Lys Pro Phe Gly Glu Asp Thr Ser Gln Leu Glu
 65 70 75 80
 Phe Ser Glu Leu Leu Glu Asp Ile Glu Gly Asn Gln Tyr Lys Leu Thr
 85 90 95
 Gly Leu Leu Glu Tyr Tyr Phe Asn Phe Phe Arg Gly Met Tyr Glu Phe
 100 105 110
 Lys Gln Lys Met Phe Val Ser Ala Met Met Tyr Tyr Lys Arg Ala Glu
 115 120 125
 Lys Asn Leu Ala Leu Val Ser Asp Asp Ile Glu Lys Ala Glu Phe Ala
 130 135 140
 Phe Lys Met Ala Glu Ile Phe Tyr Asn Leu Lys Gln Thr Tyr Val Ser
 145 150 155 160
 Met Ser Tyr Ala Val Gln Ala Leu Glu Thr Tyr Gln Met Tyr Glu Thr
 165 170 175
 Tyr Thr Val Arg Arg Ile Gln Cys Glu Phe Val Ile Ala Gly Asn Tyr
 180 185 190
 Asp Asp Met Gln Tyr Pro Glu Arg Ala Leu Pro His Leu Glu Leu Ala
 195 200 205
 Leu Asp Leu Ala Lys Lys Glu Gly Asn Pro Arg Leu Ile Ser Ser Ala
 210 215 220
 Leu Tyr Asn Leu Gly Asn Cys Tyr Glu Lys Met Gly Glu Leu Gln Lys
 225 230 235 240
 Ala Ala Glu Tyr Phe Gly Lys Ser Val Ser Ile Cys Lys Ser Glu Lys
 245 250 255
 Phe Asp Asn Leu Pro His Ser Ile Tyr Ser Leu Thr Gln Val Leu Tyr
 260 265 270
 Lys Gln Lys Asn Asp Ala Glu Ala Gln Lys Lys Tyr Arg Glu Gly Leu
 275 280 285
 Glu Ile Ala Arg Gln Tyr Ser Asp Glu Leu Phe Val Glu Leu Phe Gln
 290 295 300
 Phe Leu His Ala Leu Tyr Gly Lys Asn Ile Asp Thr Glu Ser Val Ser
 305 310 315 320
 His Thr Phe Gln Phe Leu Glu Glu His Met Leu Tyr Pro Tyr Ile Glu
 325 330 335
 Glu Leu Ala His Asp Ala Ala Gln Phe Tyr Ile Glu Asn Gly Gln Pro
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 Ile Gln Arg Gly Asp Cys Leu Tyr Glu Ile
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<210> 17

<211> 1353
 <212> DNA
 <213> Bacillus subtilis

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 acgtatacga cgattgaaaa tgagcagcat gttctgacag agtaccgcct gccagggttcg 180
 attgaaaggc gctattacag cgaggaagcg acggcgccga caactgtccg ctccgtacag 240
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 acgggtgtat cataccgcat agcagtgccaa aaa 1353

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 <212> PRT
 <213> Bacillus subtilis

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 Leu Arg Asp Phe Phe Thr Asn Glu Thr Tyr Thr Thr Ile Glu Asn Glu
 35 40 45
 Gln His Val Leu Thr Glu Tyr Arg Leu Pro Gly Ser Ile Glu Arg Arg
 50 55 60
 Tyr Tyr Ser Glu Glu Ala Thr Ala Pro Thr Thr Val Arg Ser Val Gln
 65 70 75 80
 His Val Leu Leu Pro Glu Asn Glu Glu Ala Ser Ser Asp Lys Asp Leu
 85 90 95
 Ser Ile Leu Ser Ser Ser Phe Ile His Lys Val Tyr Lys Leu Ala Asp
 100 105 110
 Lys Gln Glu Ala Lys Lys Lys Arg Tyr Ser Ala Asp Val Asn Gly Glu
 115 120 125
 Lys Val Phe Phe Val Ile Lys Lys Gly Leu Ser Val Asn Gly Gln Ser
 130 135 140
 Ala Met Met Leu Ser Tyr Ala Leu Asp Ser Tyr Arg Asp Asp Leu Ala
 145 150 155 160
 Tyr Thr Leu Phe Lys Gln Leu Leu Phe Ile Ile Ala Val Val Ile Leu
 165 170 175

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gaaaacacct	gctttgcgac	gattaatccg	gagcagccag	atcagctatt	agaagaagaa	1200
gcagaagtca	tagacaagct	gctatttctt	gtccagcatt	ccgaaaagct	gggccgccat	1260
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<210> 20
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 <212> PRT
 <213> Bacillus subtilis

<400> 20

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			20					25					30		
Ser	Lys	Tyr	Leu	Asp	Leu	Leu	Ala	Gln	Lys	Tyr	Asp	Cys	Glu	Glu	Lys
		35					40					45			
Val	Val	Thr	Glu	Ile	Ile	Asn	Leu	Lys	Ala	Ile	Leu	Asn	Leu	Pro	Lys
	50					55					60				
Gly	Thr	Glu	His	Phe	Val	Ser	Asp	Leu	His	Gly	Glu	Tyr	Gln	Ala	Phe
65					70				75					80	
Gln	His	Val	Leu	Arg	Asn	Gly	Ser	Gly	Arg	Val	Lys	Glu	Lys	Ile	Arg
				85				90						95	
Asp	Ile	Phe	Ser	Gly	Val	Ile	Tyr	Asp	Arg	Glu	Ile	Asp	Glu	Leu	Ala
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Ala	Leu	Val	Tyr	Tyr	Pro	Glu	Asp	Lys	Leu	Lys	Leu	Ile	Lys	His	Asp
		115					120					125			
Phe	Asp	Ala	Lys	Glu	Ala	Leu	Asn	Glu	Trp	Tyr	Lys	Glu	Thr	Ile	His
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Arg	Met	Ile	Lys	Leu	Val	Ser	Tyr	Cys	Ser	Ser	Lys	Tyr	Thr	Arg	Ser
145					150				155					160	
Lys	Leu	Arg	Lys	Ala	Leu	Pro	Ala	Gln	Phe	Ala	Tyr	Ile	Thr	Glu	Glu
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Leu	Leu	Tyr	Lys	Thr	Glu	Gln	Ala	Gly	Asn	Lys	Glu	Gln	Tyr	Tyr	Ser
			180					185					190		
Glu	Ile	Ile	Asp	Gln	Ile	Ile	Glu	Leu	Gly	Gln	Ala	Asp	Lys	Leu	Ile
		195					200					205			
Thr	Gly	Leu	Ala	Tyr	Ser	Val	Gln	Arg	Leu	Val	Val	Asp	His	Leu	His
	210					215					220				
Val	Val	Gly	Asp	Ile	Tyr	Asp	Arg	Gly	Pro	Gln	Pro	Asp	Arg	Ile	Met
225					230				235					240	

Glu	Glu	Leu	Ile	Asn	Tyr	His	Ser	Val	Asp	Ile	Gln	Trp	Gly	Asn	His		
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Asp	Val	Leu	Trp	Ile	Gly	Ala	Tyr	Ser	Gly	Ser	Lys	Val	Cys	Leu	Ala		
			260					265					270				
Asn	Ile	Ile	Arg	Ile	Cys	Ala	Arg	Tyr	Asp	Asn	Leu	Asp	Ile	Ile	Glu		
		275					280					285					
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	290				295						300						
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305				310						315					320		
Pro	Glu	Asp	Glu	Ile	Lys	Gln	Ile	Thr	Lys	Ile	His	Gln	Ala	Ile	Ala		
			325						330					335			
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			340					345					350				
Phe	Asn	Met	Glu	Glu	Arg	Leu	Leu	Leu	Glu	Lys	Ile	Asp	Tyr	Asp	Lys		
		355					360					365					
Asn	Glu	Ile	Thr	Leu	Asn	Gly	Lys	Thr	Tyr	Gln	Leu	Glu	Asn	Thr	Cys		
	370					375					380						
Phe	Ala	Thr	Ile	Asn	Pro	Glu	Gln	Pro	Asp	Gln	Leu	Leu	Glu	Glu	Glu		
385				390						395					400		
Ala	Glu	Val	Ile	Asp	Lys	Leu	Leu	Phe	Ser	Val	Gln	His	Ser	Glu	Lys		
			405						410					415			
Leu	Gly	Arg	His	Met	Asn	Phe	Met	Met	Lys	Lys	Gly	Ser	Leu	Tyr	Leu		
		420						425					430				
Lys	Tyr	Asn	Gly	Asn	Leu	Leu	Ile	His	Gly	Cys	Ile	Pro	Val	Asp	Glu		
	435						440					445					
Asn	Gly	Asn	Met	Glu	Thr	Met	Met	Ile	Glu	Asp	Lys	Pro	Tyr	Ala	Gly		
	450					455					460						
Arg	Glu	Leu	Leu	Asp	Val	Phe	Glu	Arg	Phe	Leu	Arg	Glu	Ala	Phe	Ala		
465				470						475					480		
His	Pro	Glu	Glu	Thr	Asp	Asp	Leu	Ala	Thr	Asp	Met	Ala	Trp	Tyr	Leu		
			485						490					495			
Trp	Thr	Gly	Glu	Tyr	Ser	Ser	Leu	Phe	Gly	Lys	Arg	Ala	Met	Thr	Thr		
		500						505					510				
Phe	Glu	Arg	Tyr	Phe	Ile	Lys	Glu	Lys	Glu	Thr	His	Lys	Glu	Lys	Lys		
	515						520					525					
Asn	Pro	Tyr	Tyr	Tyr	Leu	Arg	Glu	Asp	Glu	Ala	Thr	Cys	Arg	Asn	Ile		
	530					535					540						
Leu	Ala	Glu	Phe	Gly	Leu	Asn	Pro	Asp	His	Gly	His	Ile	Ile	Asn	Gly		
545					550					555					560		
His	Thr	Pro	Val	Lys	Glu	Ile	Glu	Gly	Glu	Asp	Pro	Ile	Lys	Ala	Asn		
			565						570					575			
Gly	Lys	Met	Ile	Val	Ile	Asp	Gly	Gly	Phe	Ser	Lys	Ala	Tyr	Gln	Ser		
		580						585					590				
Thr	Thr	Gly	Ile	Ala	Gly	Tyr	Thr	Leu	Leu	Tyr	Asn	Ser	Tyr	Gly	Met		
	595						600					605					
Gln	Leu	Val	Ala	His	Lys	His	Phe	Asn	Ser	Lys	Ala	Glu	Val	Leu	Ser		
	610					615					620						
Thr	Gly	Thr	Asp	Val	Leu	Thr	Val	Lys	Arg	Leu	Val	Asp	Lys	Glu	Leu		
625					630					635					640		
Glu	Arg	Lys	Lys	Val	Lys	Glu	Thr	Asn	Val	Gly	Glu	Glu	Leu	Leu	Gln		
			645						650					655			
Glu	Val	Ala	Ile	Leu	Glu	Ser	Leu	Arg	Glu	Tyr	Arg	Tyr	Met	Lys			
			660					665					670				

<210> 21
<211> 765

<212> DNA

<213> *Bacillus subtilis*

<400> 21

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gaactgtcag	agattccgaa	atatggagac	ttcggtatcg	gaacctttaa	caagcttgac	180
ggagagctga	ttgggtttga	cggcgaaattt	taccgtcttc	gtcagacgg	aaccgcgaca	240
cgggtccaaa	atggagaccg	ttcacggttc	tgttcattta	cgttctttac	accggacatg	300
acgcacaaaa	ttgatgcgaa	aatgacacgc	gaagactttg	aaaaagagat	caacagcatg	360
ctgccaaagca	gaaacttatt	ttatgcaatt	cgcattgacg	gattgtttaa	aaaggtgcag	420
acaagaacag	tagaacttca	agaaaaacct	tacgtgccaa	tggttgaagc	ggtcaaaaca	480
cagccgattt	tcaacttcga	caacgtgaga	ggaacgattg	taggtttctt	gacaccagct	540
tatgcaaacg	gaatcgccgt	ttctggctat	cacctgcact	tcattgacga	aggacgcaat	600
tcaggcgagc	acgtttttga	ctatgtgctt	gaggattgca	cggttacgat	ttctcaaaaa	660
atgaacatga	atctcagact	tccgaacaca	gcggatttct	ttaatgcgaa	tctggataac	720
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<210> 22

<211> 255

<212> PRT

<213> *Bacillus subtilis*

<400> 22

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Gln	Pro	Val	Ser	Gln	Ile	Tyr	Gln	Val	Ser	Thr	Met	Thr	Ser	Leu	Leu
		20						25					30		
Asp	Gly	Val	Tyr	Asp	Gly	Asp	Phe	Glu	Leu	Ser	Glu	Ile	Pro	Lys	Tyr
	35						40					45			
Gly	Asp	Phe	Gly	Ile	Gly	Thr	Phe	Asn	Lys	Leu	Asp	Gly	Glu	Leu	Ile
	50					55					60				
Gly	Phe	Asp	Gly	Glu	Phe	Tyr	Arg	Leu	Arg	Ser	Asp	Gly	Thr	Ala	Thr
65					70					75					80
Pro	Val	Gln	Asn	Gly	Asp	Arg	Ser	Pro	Phe	Cys	Ser	Phe	Thr	Phe	Phe
			85						90					95	
Thr	Pro	Asp	Met	Thr	His	Lys	Ile	Asp	Ala	Lys	Met	Thr	Arg	Glu	Asp
		100						105					110		
Phe	Glu	Lys	Glu	Ile	Asn	Ser	Met	Leu	Pro	Ser	Arg	Asn	Leu	Phe	Tyr
		115					120					125			
Ala	Ile	Arg	Ile	Asp	Gly	Leu	Phe	Lys	Lys	Val	Gln	Thr	Arg	Thr	Val
	130					135					140				
Glu	Leu	Gln	Glu	Lys	Pro	Tyr	Val	Pro	Met	Val	Glu	Ala	Val	Lys	Thr
145					150					155					160
Gln	Pro	Ile	Phe	Asn	Phe	Asp	Asn	Val	Arg	Gly	Thr	Ile	Val	Gly	Phe
			165					170						175	
Leu	Thr	Pro	Ala	Tyr	Ala	Asn	Gly	Ile	Ala	Val	Ser	Gly	Tyr	His	Leu
		180					185						190		
His	Phe	Ile	Asp	Glu	Gly	Arg	Asn	Ser	Gly	Gly	His	Val	Phe	Asp	Tyr
		195					200					205			
Val	Leu	Glu	Asp	Cys	Thr	Val	Thr	Ile	Ser	Gln	Lys	Met	Asn	Met	Asn
	210						215					220			
Leu	Arg	Leu	Pro	Asn	Thr	Ala	Asp	Phe	Phe	Asn	Ala	Asn	Leu	Asp	Asn
225					230					235					240
Pro	Asp	Phe	Ala	Lys	Asp	Ile	Glu	Thr	Thr	Glu	Gly	Ser	Pro	Glu	
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<210> 23
 <211> 1020
 <212> DNA
 <213> *Bacillus subtilis*

<400> 23
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 ctggctcatt taataaaagta tgacacaatt cacggcagat acgacaaaaga ggttgtggct 180
 ggtgaagata gcctgatcgt aaatggaaag aaagtgcctt tgtaaacag ccgtgatcca 240
 aaacagctgc cttggcgga atatgatatt gacatagtcg tcgaagcaac agggaagttt 300
 aatgctaaag ataaagcgat gggccatata gaagcaggtg caaaaaaagt gattttgacc 360
 gctccgggaa aaaatgaaga cgttaccatt gtgatggcg taaatgagga ccaattcgac 420
 gctgagcgcc atgtcattat ttcaaattgcg tcatgcacga caaattgcct tgcgcctggt 480
 gtaaaagtgc tggatgaaga gtttggcatt gagagcggtc tgatgactac agttcatgcg 540
 tatacgaatg accaaaaaaa tattgataac cgcacaaaag atttgcgccg ggcgcgggct 600
 tgcggtgaat ccatcattcc aacaacaaca ggagcggcaa aggcgcttcc gcttgtgctg 660
 ccgcattctga aagggaaaact tcacggcctc gccttgctg tccctgttcc gaacgtctca 720
 ttggttgatc tcgttggtga tctgaaaacg gatgttacgg ctgaagaagt aaacgaggca 780
 tttaaacgcg ctgccaaaac gtcgatgtac ggtgtacttg attactcaga tgaaccgctc 840
 gtttcgactg attataatac gaatccgcatt tcacgggtca ttgacgggct tacaacaatg 900
 gtaatggaag acaggaaagt aaaggtgctg gcgtgggtatg acaacgaatg gggctactcc 960
 tgcagagttg ttgatctaatt ccgccatgta gcggcacgaa tgaaacatcc gtctgctgta 1020

<210> 24
 <211> 340
 <212> PRT
 <213> *Bacillus subtilis*

<400> 24
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 1 5 10 15
 Val Phe Arg Lys Ala Met Leu Asp Asp Gln Ile Gln Val Val Ala Ile
 20 25 30
 Asn Ala Ser Tyr Ser Ala Glu Thr Leu Ala His Leu Ile Lys Tyr Asp
 35 40 45
 Thr Ile His Gly Arg Tyr Asp Lys Glu Val Val Ala Gly Glu Asp Ser
 50 55 60
 Leu Ile Val Asn Gly Lys Lys Val Leu Leu Leu Asn Ser Arg Asp Pro
 65 70 75 80
 Lys Gln Leu Pro Trp Arg Glu Tyr Asp Ile Asp Ile Val Val Glu Ala
 85 90 95
 Thr Gly Lys Phe Asn Ala Lys Asp Lys Ala Met Gly His Ile Glu Ala
 100 105 110
 Gly Ala Lys Lys Val Ile Leu Thr Ala Pro Gly Lys Asn Glu Asp Val
 115 120 125
 Thr Ile Val Met Gly Val Asn Glu Asp Gln Phe Asp Ala Glu Arg His
 130 135 140
 Val Ile Ile Ser Asn Ala Ser Cys Thr Thr Asn Cys Leu Ala Pro Val
 145 150 155 160
 Val Lys Val Leu Asp Glu Glu Phe Gly Ile Glu Ser Gly Leu Met Thr
 165 170 175
 Thr Val His Ala Tyr Thr Asn Asp Gln Lys Asn Ile Asp Asn Pro His
 180 185 190
 Lys Asp Leu Arg Arg Ala Arg Ala Cys Gly Glu Ser Ile Ile Pro Thr
 195 200 205
 Thr Thr Gly Ala Ala Lys Ala Leu Ser Leu Val Leu Pro His Leu Lys

210		215		220
Gly Lys Leu His Gly Leu Ala Leu Arg Val Pro Val Pro Asn Val Ser				
225		230		235
Leu Val Asp Leu Val Val Asp Leu Lys Thr Asp Val Thr Ala Glu Glu				240
	245		250	255
Val Asn Glu Ala Phe Lys Arg Ala Ala Lys Thr Ser Met Tyr Gly Val				
	260		265	270
Leu Asp Tyr Ser Asp Glu Pro Leu Val Ser Thr Asp Tyr Asn Thr Asn				
	275		280	285
Pro His Ser Ala Val Ile Asp Gly Leu Thr Thr Met Val Met Glu Asp				
	290		295	300
Arg Lys Val Lys Val Leu Ala Trp Tyr Asp Asn Glu Trp Gly Tyr Ser				
305		310		315
Cys Arg Val Val Asp Leu Ile Arg His Val Ala Ala Arg Met Lys His				320
	325		330	335
Pro Ser Ala Val				
	340			

<210> 25
 <211> 1176
 <212> DNA
 <213> Bacillus subtilis

<400> 25

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aaagtcattc	agctatcttc	taataattac	ctcggattca	cttcacatcc	tagactcatc	180
aacgccgcac	aggaggccgt	tcagcagtat	ggagccggca	ccggatcagt	gagaacgatt	240
gcgggtacat	ttacaatgca	tcaagagctt	gagaaaaagc	tggcagcctt	taaaaaaacg	300
gaggcggcac	ttgtattcca	atcaggcttc	acaacaaacc	aaggcgtact	ttcaagtatt	360
ctatcaaaag	aggacattgt	catctcagat	gaattgaacc	atgcctctat	tattgacgga	420
attcgactga	caaaggcgga	taaaaaggtg	tatcagcacg	tcaatatgag	tgatttagag	480
cgggtgctga	gaaagtcaat	gaattatcgg	atgcgtctga	ttgtgacaga	cggcgtatth	540
tccatggatg	gcaacatagc	tcctctgcct	gatattgtag	agctcgtctg	gaaatatgac	600
gcattttgtg	tgggtggatg	cgcccatgca	tccggagtag	ttggcgaaaa	cggcagggga	660
acgggtgaatc	acttcgggtc	tgacggcaga	gtgcatattc	aggtcgggaa	attaagcaag	720
gcaatcggag	tgctcggcgg	ctacgctgca	ggttcaaagg	tgctgatcga	ttattttgcgc	780
cataaaggcc	gtccattttt	attcagcaca	tctcatccgc	cggcagtcac	tgacgcttgt	840
atggaagcga	ttgatgtctt	gcttgaagag	ccggagcata	tggagcgctt	gtgggagaat	900
actgcctatt	ttaaagcaat	gcttgtgaaa	atgggtctga	ctctcacgaa	gagtgaacg	960
ccgattcttc	ctattttta	aggtgatgaa	gggtgtggca	agcaattttc	agatcagctc	1020
ctttctcgcg	gtgtttttgc	ccaaagtatc	gttttcccga	ctgtagcaaa	gggaaaagcc	1080
agaattcgca	cgattataac	agcagagcac	accaaagatg	aactggatca	ggcgcttgat	1140
gtcatcgaaa	agacggcaaa	ggagctccag	ctattg			1176

<210> 26
 <211> 392
 <212> PRT
 <213> Bacillus subtilis

<400> 26

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	20
Pro Ser Val Thr Val Asn His Gln Lys Val Ile Gln Leu Ser Ser Asn	
	35
	40
	45

Asn	Tyr	Leu	Gly	Phe	Thr	Ser	His	Pro	Arg	Leu	Ile	Asn	Ala	Ala	Gln
50						55					60				
Glu	Ala	Val	Gln	Gln	Tyr	Gly	Ala	Gly	Thr	Gly	Ser	Val	Arg	Thr	Ile
65					70					75					80
Ala	Gly	Thr	Phe	Thr	Met	His	Gln	Glu	Leu	Glu	Lys	Lys	Leu	Ala	Ala
				85					90					95	
Phe	Lys	Lys	Thr	Glu	Ala	Ala	Leu	Val	Phe	Gln	Ser	Gly	Phe	Thr	Thr
			100					105					110		
Asn	Gln	Gly	Val	Leu	Ser	Ser	Ile	Leu	Ser	Lys	Glu	Asp	Ile	Val	Ile
		115					120					125			
Ser	Asp	Glu	Leu	Asn	His	Ala	Ser	Ile	Ile	Asp	Gly	Ile	Arg	Leu	Thr
	130					135					140				
Lys	Ala	Asp	Lys	Lys	Val	Tyr	Gln	His	Val	Asn	Met	Ser	Asp	Leu	Glu
145					150					155					160
Arg	Val	Leu	Arg	Lys	Ser	Met	Asn	Tyr	Arg	Met	Arg	Leu	Ile	Val	Thr
				165					170					175	
Asp	Gly	Val	Phe	Ser	Met	Asp	Gly	Asn	Ile	Ala	Pro	Leu	Pro	Asp	Ile
			180					185				190			
Val	Glu	Leu	Ala	Glu	Lys	Tyr	Asp	Ala	Phe	Val	Met	Val	Asp	Asp	Ala
			195				200					205			
His	Ala	Ser	Gly	Val	Leu	Gly	Glu	Asn	Gly	Arg	Gly	Thr	Val	Asn	His
	210					215					220				
Phe	Gly	Leu	Asp	Gly	Arg	Val	His	Ile	Gln	Val	Gly	Thr	Leu	Ser	Lys
225					230					235					240
Ala	Ile	Gly	Val	Leu	Gly	Gly	Tyr	Ala	Ala	Gly	Ser	Lys	Val	Leu	Ile
				245					250					255	
Asp	Tyr	Leu	Arg	His	Lys	Gly	Arg	Pro	Phe	Leu	Phe	Ser	Thr	Ser	His
		260						265					270		
Pro	Pro	Ala	Val	Thr	Ala	Ala	Cys	Met	Glu	Ala	Ile	Asp	Val	Leu	Leu
		275					280					285			
Glu	Glu	Pro	Glu	His	Met	Glu	Arg	Leu	Trp	Glu	Asn	Thr	Ala	Tyr	Phe
	290					295					300				
Lys	Ala	Met	Leu	Val	Lys	Met	Gly	Leu	Thr	Leu	Thr	Lys	Ser	Glu	Thr
305					310					315					320
Pro	Ile	Leu	Pro	Ile	Leu	Ile	Gly	Asp	Glu	Gly	Val	Ala	Lys	Gln	Phe
				325				330						335	
Ser	Asp	Gln	Leu	Leu	Ser	Arg	Gly	Val	Phe	Ala	Gln	Ser	Ile	Val	Phe
		340					345						350		
Pro	Thr	Val	Ala	Lys	Gly	Lys	Ala	Arg	Ile	Arg	Thr	Ile	Ile	Thr	Ala
		355					360					365			
Glu	His	Thr	Lys	Asp	Glu	Leu	Asp	Gln	Ala	Leu	Asp	Val	Ile	Glu	Lys
	370					375					380				
Thr	Ala	Lys	Glu	Leu	Gln	Leu	Leu								
385					390										

<210> 27
 <211> 1581
 <212> DNA
 <213> *Bacillus subtilis*

<400> 27	
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acatccacag gtgctgttcg cgcgacaaca ggcgcttaca caggacgctc acctaaagat	180
aaattcatcg tggaggaaga aagcacgaaa aataagatcg attggggccc ggtgaatcag	240
ccgatttcag aagaagcgtt tgagcggctg tacacgaaag ttgtcagcta tttaaaggag	300
cgagatgaac tgtttgtttt cgaaggattt gccggagcag acgagaaata caggctgccg	360

atcactgtcg	taaatgagtt	cgcattggcac	aattttatttg	cgcggcagct	gtttatccgt	420
ccggaaggaa	atgataagaa	aacagttgag	cagccgttca	ccattctttc	tgctccgcat	480
ttcaaagcgg	atccaaaaac	agacggcact	cattccgaaa	cgttttattat	tgtctctttc	540
gaaaagcggg	caattttta	cggcggaact	gagtatgccg	gtgaaatgaa	gaagtccatt	600
ttctccatta	tgaatttcct	gctgcctgaa	agagatattt	tatctatgca	ctgctccgcc	660
aatgtcgggtg	aaaaaggcga	tgctgccctt	ttcttcggac	tgtcaggaac	aggaaagacc	720
accctgtcgg	cagatgctga	ccgcaagctg	atcgggtgacg	atgaacatgg	ctgggtctgat	780
acaggcgtct	ttaatatattg	aggcggatgc	tacgctaagt	gtattcattt	aagcgaggaa	840
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gatgaagata	cacgcgaagc	caattatgat	gattccttct	atactgaaaa	cacgcgggca	960
gcttaccgga	ttcatatgat	taataacatc	gtgactccaa	gcatggccgg	ccatccgtca	1020
gccattgtat	ttttgacggc	tgatgccttc	ggagtctctg	cgccgatcag	caaactaacg	1080
aaggagcagg	tgatgtacca	ttttttgagc	ggttacacga	gtaagcttgc	cggaaccgaa	1140
cgtggtgtca	cgtctcctga	aacgacgttt	tctacatgct	tcggctcacc	gttcctgccg	1200
cttcctgctc	acgtctatgc	tgaaatgctc	ggcaaaaaga	tcgatgaaca	cggcgagac	1260
gttttcttag	tcaataccgg	atggaccggg	ggcggtacg	gcacaggcga	acgaatgaag	1320
ctttcttaca	ctagagcaat	ggtcaaagca	gcgattgaag	gcaaattaga	ggatgctgaa	1380
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catatccttc	agcctgaaaa	cacgtggacc	aacaaggaag	aatacaaaga	aaaagcagtc	1500
taccttgcaa	atgaattcaa	agagaacttt	aaaaagttcg	cacataccga	tgccatcgcc	1560
caggcaggcg	gcctctcgt	a				1581

<210> 28
 <211> 527
 <212> PRT
 <213> Bacillus subtilis

<400> 28

Met	Asn	Ser	Val	Asp	Leu	Thr	Ala	Asp	Leu	Gln	Ala	Leu	Leu	Thr	Cys
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			20					25					30		
Leu	Ser	Arg	Asn	Glu	Gly	Ile	Leu	Thr	Ser	Thr	Gly	Ala	Val	Arg	Ala
			35				40					45			
Thr	Thr	Gly	Ala	Tyr	Thr	Gly	Arg	Ser	Pro	Lys	Asp	Lys	Phe	Ile	Val
	50					55					60				
Glu	Glu	Glu	Ser	Thr	Lys	Asn	Lys	Ile	Asp	Trp	Gly	Pro	Val	Asn	Gln
65					70				75					80	
Pro	Ile	Ser	Glu	Glu	Ala	Phe	Glu	Arg	Leu	Tyr	Thr	Lys	Val	Val	Ser
					85			90					95		
Tyr	Leu	Lys	Glu	Arg	Asp	Glu	Leu	Phe	Val	Phe	Glu	Gly	Phe	Ala	Gly
			100					105					110		
Ala	Asp	Glu	Lys	Tyr	Arg	Leu	Pro	Ile	Thr	Val	Val	Asn	Glu	Phe	Ala
			115				120					125			
Trp	His	Asn	Leu	Phe	Ala	Arg	Gln	Leu	Phe	Ile	Arg	Pro	Glu	Gly	Asn
	130					135					140				
Asp	Lys	Lys	Thr	Val	Glu	Gln	Pro	Phe	Thr	Ile	Leu	Ser	Ala	Pro	His
145					150					155				160	
Phe	Lys	Ala	Asp	Pro	Lys	Thr	Asp	Gly	Thr	His	Ser	Glu	Thr	Phe	Ile
				165				170						175	
Ile	Val	Ser	Phe	Glu	Lys	Arg	Thr	Ile	Leu	Ile	Gly	Gly	Thr	Glu	Tyr
			180					185					190		
Ala	Gly	Glu	Met	Lys	Lys	Ser	Ile	Phe	Ser	Ile	Met	Asn	Phe	Leu	Leu
			195				200					205			
Pro	Glu	Arg	Asp	Ile	Leu	Ser	Met	His	Cys	Ser	Ala	Asn	Val	Gly	Glu
	210					215					220				
Lys	Gly	Asp	Val	Ala	Leu	Phe	Phe	Gly	Leu	Ser	Gly	Thr	Gly	Lys	Thr

225					230					235				240	
Thr	Leu	Ser	Ala	Asp	Ala	Asp	Arg	Lys	Leu	Ile	Gly	Asp	Asp	Glu	His
				245					250					255	
Gly	Trp	Ser	Asp	Thr	Gly	Val	Phe	Asn	Ile	Glu	Gly	Gly	Cys	Tyr	Ala
			260					265					270		
Lys	Cys	Ile	His	Leu	Ser	Glu	Glu	Lys	Glu	Pro	Gln	Ile	Phe	Asn	Ala
		275					280					285			
Ile	Arg	Phe	Gly	Ser	Val	Leu	Glu	Asn	Val	Val	Val	Asp	Glu	Asp	Thr
	290				295					300					
Arg	Glu	Ala	Asn	Tyr	Asp	Asp	Ser	Phe	Tyr	Thr	Glu	Asn	Thr	Arg	Ala
305				310					315					320	
Ala	Tyr	Pro	Ile	His	Met	Ile	Asn	Asn	Ile	Val	Thr	Pro	Ser	Met	Ala
			325					330					335		
Gly	His	Pro	Ser	Ala	Ile	Val	Phe	Leu	Thr	Ala	Asp	Ala	Phe	Gly	Val
			340					345				350			
Leu	Pro	Pro	Ile	Ser	Lys	Leu	Thr	Lys	Glu	Gln	Val	Met	Tyr	His	Phe
		355				360					365				
Leu	Ser	Gly	Tyr	Thr	Ser	Lys	Leu	Ala	Gly	Thr	Glu	Arg	Gly	Val	Thr
	370				375					380					
Ser	Pro	Glu	Thr	Thr	Phe	Ser	Thr	Cys	Phe	Gly	Ser	Pro	Phe	Leu	Pro
385				390				395						400	
Leu	Pro	Ala	His	Val	Tyr	Ala	Glu	Met	Leu	Gly	Lys	Lys	Ile	Asp	Glu
			405					410					415		
His	Gly	Ala	Asp	Val	Phe	Leu	Val	Asn	Thr	Gly	Trp	Thr	Gly	Gly	Gly
	420							425				430			
Tyr	Gly	Thr	Gly	Glu	Arg	Met	Lys	Leu	Ser	Tyr	Thr	Arg	Ala	Met	Val
	435					440				445					
Lys	Ala	Ala	Ile	Glu	Gly	Lys	Leu	Glu	Asp	Ala	Glu	Met	Ile	Thr	Asp
	450				455					460					
Asp	Ile	Phe	Gly	Leu	His	Ile	Pro	Ala	His	Val	Pro	Gly	Val	Pro	Asp
465				470				475						480	
His	Ile	Leu	Gln	Pro	Glu	Asn	Thr	Trp	Thr	Asn	Lys	Glu	Glu	Tyr	Lys
			485					490					495		
Glu	Lys	Ala	Val	Tyr	Leu	Ala	Asn	Glu	Phe	Lys	Glu	Asn	Phe	Lys	Lys
		500					505					510			
Phe	Ala	His	Thr	Asp	Ala	Ile	Ala	Gln	Ala	Gly	Gly	Pro	Leu	Val	
	515					520						525			

<210> 29
 <211> 762
 <212> DNA
 <213> Bacillus subtilis

<400> 29	
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gggatattca aggggaaaga tgaatttata ttagcggttg tcgctgatgg catgggcggc	120
catcttgctg gagatgttgc gagcaagatg gctgtgaaag ccatggggga gaaatggaat	180
gaagcagaga cgattccaac tgcgcctcgc gaatgtgaaa aatgggtcat tgaacagatt	240
ctatcggtaa acagcaaaat atacgatcac gctcaagccc acgaagaatg ccaagggcatg	300
gggacgacga ttgtatgtgc actttttacg gggaaaacgg tttctggttg ccatatcgga	360
gacagcagat gctatttgct tcaggacgat gatttcgttc aagtgcagaga agaccattcg	420
cttgtaaatg aactgggttc cactggagag atttccagag aagacgctga acatcatccg	480
cgaaaaaatg tggtgacgaa ggcgcttgga acagaccagt tagtcagtat tgacaccggt	540
tcctttgata tagaaccggg agacaaactg cttctatgtt ctgacggact gacaaataaa	600
gtggaaggca ctgagttaaa agacatcctg caaagcgatt cagctcctca ggaaaaagta	660
aacctgcttg tggacaaagc caatcagaat ggcggagaag acaacattac agcagttttg	720
cttgagcttg ctttacaagt tgaagagggt gaagatcagt gc	762

<210> 30
 <211> 254
 <212> PRT
 <213> Bacillus subtilis

<400> 30
 Met Leu Thr Ala Leu Lys Thr Asp Thr Gly Lys Ile Arg Gln His Asn
 1 5 10 15
 Glu Asp Asp Ala Gly Ile Phe Lys Gly Lys Asp Glu Phe Ile Leu Ala
 20 25 30
 Val Val Ala Asp Gly Met Gly Gly His Leu Ala Gly Asp Val Ala Ser
 35 40 45
 Lys Met Ala Val Lys Ala Met Gly Glu Lys Trp Asn Glu Ala Glu Thr
 50 55 60
 Ile Pro Thr Ala Pro Ser Glu Cys Glu Lys Trp Leu Ile Glu Gln Ile
 65 70 75 80
 Leu Ser Val Asn Ser Lys Ile Tyr Asp His Ala Gln Ala His Glu Glu
 85 90 95
 Cys Gln Gly Met Gly Thr Thr Ile Val Cys Ala Leu Phe Thr Gly Lys
 100 105 110
 Thr Val Ser Val Ala His Ile Gly Asp Ser Arg Cys Tyr Leu Leu Gln
 115 120 125
 Asp Asp Asp Phe Val Gln Val Thr Glu Asp His Ser Leu Val Asn Glu
 130 135 140
 Leu Val Arg Thr Gly Glu Ile Ser Arg Glu Asp Ala Glu His His Pro
 145 150 155 160
 Arg Lys Asn Val Leu Thr Lys Ala Leu Gly Thr Asp Gln Leu Val Ser
 165 170 175
 Ile Asp Thr Arg Ser Phe Asp Ile Glu Pro Gly Asp Lys Leu Leu Leu
 180 185 190
 Cys Ser Asp Gly Leu Thr Asn Lys Val Glu Gly Thr Glu Leu Lys Asp
 195 200 205
 Ile Leu Gln Ser Asp Ser Ala Pro Gln Glu Lys Val Asn Leu Leu Val
 210 215 220
 Asp Lys Ala Asn Gln Asn Gly Gly Glu Asp Asn Ile Thr Ala Val Leu
 225 230 235 240
 Leu Glu Leu Ala Leu Gln Val Glu Glu Gly Glu Asp Gln Cys
 245 250

<210> 31
 <211> 1545
 <212> DNA
 <213> Bacillus subtilis

<400> 31
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 gcatttgggg agtcattggc ctttgtaaac actcagctcg gcaagcatta tccgcttgtc 120
 ataaatggag aaaaaattga aacggaccgc aaaatcattt ctattaaccc ggcaaataaa 180
 gaagagatca ttgggtacgc gtctacagcg gatcaagagc ttgctgaaaa agcgatgcaa 240
 gccgcattgc aggcatattga ttcttgaaaa aaacaaagac cggagcaccg cgcaaataat 300
 ctctttaagg cagcggctat tttgcgcaga agaaagcatg aattttcaag ctatcttggtg 360
 aaggaagcag gaaaaccgtg gaaggaagca gatgcggaca cggctgaagc gatagacttt 420
 ttagagttct acgcgcgcca aatgtttaaag ctcaaggaag gggctccggt gaagagccgt 480
 gctggcgagg tcaatcaata tcattacgaa gcgcttggtg tcggcatcgt catttctcca 540
 tttaacttcc cgctcgcgat tatggcgagg acagcgggtg cagcgattgt gacaggaaat 600
 acgattctct taaaaccggc tgacgcagcc ccggtagtgg cagcaaaatt tgtcgaggtc 660

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atggaggaag cgggtctgcc aaacggcggt ctgaattaca ttccgggaga tgggtgcggag 720
atcggtgatt tcttagttga gcatccgaag acacgggttg tctcatttac aggttcccgt 780
gcagtcggct gccggattta tgagcgagct gccaaagtgc agccggggcca aaaatggctc 840
aaacgggtaa ttgcagaaat gggcggaata gacacagtgc ttgtcgacaa ggacgctgat 900
cttgaccttg ctgcatactc tatcgtgtat tcagcatttg gatattcagg acagaagtgt 960
tctgcgggct cccgcgcggt cattcatcag gatgtgtatg atgaagtggg ggaaaaagct 1020
gtggcgctga ccaaaacgct gactgtcggc aatccagaag atcctgatac gtatatgggt 1080
cccgatgatt atgaagcatt ctacaacaaa gtgatgaaat acattgaaat cggcaaatct 1140
gaaggcaagc tattggccgg cggagaaggg gatgattcaa aaggctactt tattcagccg 1200
acgatctttg cagatgttga tgaaaacgcc cgcttgatgc aggaagaaat tttcggcccg 1260
gttggtgcga ttgtcaaagc gcgtgatttc gatcatatgc tggagattgc caataacacg 1320
gaatacggat taacaggtgc gcttctgacg aaaaaccgtg cgcacattga acgggcgcgc 1380
gaggatttcc atgtcggaaa cctatatattt aacagaggat gtaccggagc aattgtcggc 1440
tatcagccgt tcggcggttt taatatgtca ggaacagact caaaagcagg cgggtcccgat 1500
tacttaattc ttcatatgca agccaaaaca acgtccgaag ctttt 1545

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<210> 32
<211> 515
<212> PRT
<213> Bacillus subtilis

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<400> 32
Met Thr Val Thr Tyr Ala His Glu Pro Phe Thr Asp Phe Thr Glu Ala
1          5          10          15
Lys Asn Lys Thr Ala Phe Gly Glu Ser Leu Ala Phe Val Asn Thr Gln
20        25        30
Leu Gly Lys His Tyr Pro Leu Val Ile Asn Gly Glu Lys Ile Glu Thr
35        40        45
Asp Arg Lys Ile Ile Ser Ile Asn Pro Ala Asn Lys Glu Glu Ile Ile
50        55        60
Gly Tyr Ala Ser Thr Ala Asp Gln Glu Leu Ala Glu Lys Ala Met Gln
65        70        75        80
Ala Ala Leu Gln Ala Phe Asp Ser Trp Lys Lys Gln Arg Pro Glu His
85        90        95
Arg Ala Asn Ile Leu Phe Lys Ala Ala Ala Ile Leu Arg Arg Arg Lys
100       105       110
His Glu Phe Ser Ser Tyr Leu Val Lys Glu Ala Gly Lys Pro Trp Lys
115       120       125
Glu Ala Asp Ala Asp Thr Ala Glu Ala Ile Asp Phe Leu Glu Phe Tyr
130       135       140
Ala Arg Gln Met Leu Lys Leu Lys Glu Gly Ala Pro Val Lys Ser Arg
145       150       155       160
Ala Gly Glu Val Asn Gln Tyr His Tyr Glu Ala Leu Gly Val Gly Ile
165       170       175
Val Ile Ser Pro Phe Asn Phe Pro Leu Ala Ile Met Ala Gly Thr Ala
180       185       190
Val Ala Ala Ile Val Thr Gly Asn Thr Ile Leu Leu Lys Pro Ala Asp
195       200       205
Ala Ala Pro Val Val Ala Ala Lys Phe Val Glu Val Met Glu Glu Ala
210       215       220
Gly Leu Pro Asn Gly Val Leu Asn Tyr Ile Pro Gly Asp Gly Ala Glu
225       230       235       240
Ile Gly Asp Phe Leu Val Glu His Pro Lys Thr Arg Phe Val Ser Phe
245       250       255
Thr Gly Ser Arg Ala Val Gly Cys Arg Ile Tyr Glu Arg Ala Ala Lys
260       265       270
Val Gln Pro Gly Gln Lys Trp Leu Lys Arg Val Ile Ala Glu Met Gly

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atcatttcca aagaggactt ggattgggcg atagagaaaa ttaagcacgt gctgcgaaac 1200
gca 1203

<210> 34
<211> 401
<212> PRT
<213> Bacillus subtilis

<400> 34
Met Thr Ala Leu Ser Lys Ser Lys Glu Ile Ile Asp Gln Thr Ser His
1 5 10 15
Tyr Gly Ala Asn Tyr His Pro Leu Pro Ile Val Ile Ser Glu Ala
20 25 30
Leu Gly Ala Trp Val Lys Asp Pro Glu Gly Asn Glu Tyr Met Asp Met
35 40 45
Leu Ser Ala Tyr Ser Ala Val Asn Gln Gly His Arg His Pro Lys Ile
50 55 60
Ile Gln Ala Leu Lys Asp Gln Ala Asp Lys Ile Thr Leu Thr Ser Arg
65 70 75 80
Ala Phe His Asn Asp Gln Leu Gly Pro Phe Tyr Glu Lys Thr Ala Lys
85 90 95
Leu Thr Gly Lys Glu Met Ile Leu Pro Met Asn Thr Gly Ala Glu Ala
100 105 110
Val Glu Ser Ala Val Lys Ala Ala Arg Arg Trp Ala Tyr Glu Val Lys
115 120 125
Gly Val Ala Asp Asn Gln Ala Glu Ile Ile Ala Cys Val Gly Asn Phe
130 135 140
His Gly Arg Thr Met Leu Ala Val Ser Leu Ser Ser Glu Glu Glu Tyr
145 150 155 160
Lys Arg Gly Phe Gly Pro Met Leu Pro Gly Ile Lys Leu Ile Pro Tyr
165 170 175
Gly Asp Val Glu Ala Leu Arg Gln Ala Ile Thr Pro Asn Thr Ala Ala
180 185 190
Phe Leu Phe Glu Pro Ile Gln Gly Glu Ala Gly Ile Val Ile Pro Pro
195 200 205
Glu Gly Phe Leu Gln Glu Ala Ala Ala Ile Cys Lys Glu Glu Asn Val
210 215 220
Leu Phe Ile Ala Asp Glu Ile Gln Thr Gly Leu Gly Arg Thr Gly Lys
225 230 235 240
Thr Phe Ala Cys Asp Trp Asp Gly Ile Val Pro Asp Met Tyr Ile Leu
245 250 255
Gly Lys Ala Leu Gly Gly Gly Val Phe Pro Ile Ser Cys Ile Ala Ala
260 265 270
Asp Arg Glu Ile Leu Gly Val Phe Asn Pro Gly Ser His Gly Ser Thr
275 280 285
Phe Gly Gly Asn Pro Leu Ala Cys Ala Val Ser Ile Ala Ser Leu Glu
290 295 300
Val Leu Glu Asp Glu Lys Leu Ala Asp Arg Ser Leu Glu Leu Gly Glu
305 310 315 320
Tyr Phe Lys Ser Glu Leu Glu Ser Ile Asp Ser Pro Val Ile Lys Glu
325 330 335
Val Arg Gly Arg Gly Leu Phe Ile Gly Val Glu Leu Thr Glu Ala Ala
340 345 350
Arg Pro Tyr Cys Glu Arg Leu Lys Glu Glu Gly Leu Leu Cys Lys Glu
355 360 365
Thr His Asp Thr Val Ile Arg Phe Ala Pro Pro Leu Ile Ile Ser Lys
370 375 380

Glu Asp Leu Asp Trp Ala Ile Glu Lys Ile Lys His Val Leu Arg Asn
 385 390 395 400
 Ala

<210> 35
 <211> 888
 <212> DNA
 <213> *Bacillus subtilis*

<400> 35
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 gtggatatgg gcccgagtg catccgggtac gctcatctga tgcgagaggct gtcagacatg 120
 gggatatacgg ttgaagatct cgggtgacatt ccgatcaatc gcgaaaaaat caaaaatgac 180
 gaggaactga aaaacctgaa ttccgttttg gcgggaaatg aaaaactcgc gcaaaaggtc 240
 aacaaagtca ttgaagagaa aaaattcccg cttgtcctgg gcggtgacca cagtattgcg 300
 atcggcacgc ttgcaggcac agcgaagcat tacgataatc tcggcgatcat ctggtatgac 360
 gcgcacggcg atttgaatac acttgaaact tcaccatcgg gcaatattca cggcatgccg 420
 ctccgggtca gcctaggcat tggccacgag tcaactggta accttgaagg ctacgcgcct 480
 aaaatcaaac cggaaaacgt cgtcatcatt ggcgcccggg cacttgatga aggggagcgc 540
 aagtacatta aggaaagcgg catgaagggtg tacacaatgc acgaaatcga tcgtcttggc 600
 atgacaaagg tcattgaaga aacccttgat tatttatcag catgtgatgg cgtccatctg 660
 agccttgatc tggacggact tgatccgaac gacgcaccgg gtgtcggaac ccctgtcgtc 720
 ggcggcacatc gctaccggga gagccatttg gctatggaaa tgctgtatga cgcaggcatc 780
 attacctcag ccgaattcgt tgagggttaac ccgatccttg atcacaaaaa caaaacgggc 840
 aaaacagcag tagagctcgt agaatccctg ttagggaaga agctgctg 888

<210> 36
 <211> 296
 <212> PRT
 <213> *Bacillus subtilis*

<400> 36
 Met Asp Lys Thr Ile Ser Val Ile Gly Met Pro Met Asp Leu Gly Gln
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 Ala Arg Arg Gly Val Asp Met Gly Pro Ser Ala Ile Arg Tyr Ala His
 20 25 30
 Leu Ile Glu Arg Leu Ser Asp Met Gly Tyr Thr Val Glu Asp Leu Gly
 35 40 45
 Asp Ile Pro Ile Asn Arg Glu Lys Ile Lys Asn Asp Glu Glu Leu Lys
 50 55 60
 Asn Leu Asn Ser Val Leu Ala Gly Asn Glu Lys Leu Ala Gln Lys Val
 65 70 75 80
 Asn Lys Val Ile Glu Lys Lys Phe Pro Leu Val Leu Gly Gly Asp
 85 90 95
 His Ser Ile Ala Ile Gly Thr Leu Ala Gly Thr Ala Lys His Tyr Asp
 100 105 110
 Asn Leu Gly Val Ile Trp Tyr Asp Ala His Gly Asp Leu Asn Thr Leu
 115 120 125
 Glu Thr Ser Pro Ser Gly Asn Ile His Gly Met Pro Leu Ala Val Ser
 130 135 140
 Leu Gly Ile Gly His Glu Ser Leu Val Asn Leu Glu Gly Tyr Ala Pro
 145 150 155 160
 Lys Ile Lys Pro Glu Asn Val Val Ile Ile Gly Ala Arg Ser Leu Asp
 165 170 175
 Glu Gly Glu Arg Lys Tyr Ile Lys Glu Ser Gly Met Lys Val Tyr Thr
 180 185 190

Met	His	Glu	Ile	Asp	Arg	Leu	Gly	Met	Thr	Lys	Val	Ile	Glu	Glu	Thr
		195					200					205			
Leu	Asp	Tyr	Leu	Ser	Ala	Cys	Asp	Gly	Val	His	Leu	Ser	Leu	Asp	Leu
		210				215					220				
Asp	Gly	Leu	Asp	Pro	Asn	Asp	Ala	Pro	Gly	Val	Gly	Thr	Pro	Val	Val
225					230					235					240
Gly	Gly	Ile	Ser	Tyr	Arg	Glu	Ser	His	Leu	Ala	Met	Glu	Met	Leu	Tyr
			245					250					255		
Asp	Ala	Gly	Ile	Ile	Thr	Ser	Ala	Glu	Phe	Val	Glu	Val	Asn	Pro	Ile
		260						265					270		
Leu	Asp	His	Lys	Asn	Lys	Thr	Gly	Lys	Thr	Ala	Val	Glu	Leu	Val	Glu
		275					280					285			
Ser	Leu	Leu	Gly	Lys	Lys	Leu	Leu								
		290				295									

<210> 37
 <211> 1041
 <212> DNA
 <213> Bacillus subtilis

<400> 37
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 actgaagttc ccattcctga gattgataaa catgaagtcc tcataaaaagt gaaagccgct 120
 tccatatgcg gcacggatgt ccacatttat aattgggcatc aatgggcacg tcagagaatc 180
 aaaacaccct atgttttcgg ccatgagttc agcggcatcg tagagggcgt gggagagaat 240
 gtcagcagtg taaaagtggg agagtatgtg tctgcggaaa cacacattgt ctgtggtgaa 300
 tgtgtccctt gcctaacagg aaaatctcat gtgtgtacca atactgctat aatcggagtg 360
 gacacggcag gctgttttgc ggagtatgta aaagttccag ctgataacat ttggagaaat 420
 cccgctgata tggaccctgc gattgcttcc attcaagagc ctttaggaaa tgcagttcat 480
 accgtactcg agagccagcc tgcaggagga acgactgcag tcattggatg cggaccgatt 540
 ggtcttatgg ctggtgcggg tgcaaaagca gcaggagctt ctcaggtgat agcgattgat 600
 aagaatgaat acaggctgag gcttgcaaaa caaatgggag cgacttgtag tgtttctatt 660
 gaaaaagaag acccgctcaa aattgtaagc gctttaacga gtggagaagg agcagatctt 720
 gtttgtgaga tgtcgggcca tccctcagcg attgcccaag gtcttgcatg ggctgcgaat 780
 ggcggaagat ttcataattct cagcttgccg gaacatccgg tgacaattga tttgacgaat 840
 aaagtgggat ttaaagggtc taccatccaa ggaatcacag gaagaaaaat gttttcaaca 900
 tggcgccagg tgtctcagtt gatcagttca aacatgatcg atcttgacc tgttattacc 960
 catcagtttc cattagagga gtttgaaaaa ggtttcgaac tgatgagaag cgggcagtg 1020
 ggaaaagtaa ttttaattcc a 1041

<210> 38
 <211> 347
 <212> PRT
 <213> Bacillus subtilis

<400> 38
 Met Gln Ser Gly Lys Met Lys Ala Leu Met Lys Lys Asp Gly Ala Phe
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 Gly Ala Val Leu Thr Glu Val Pro Ile Pro Glu Ile Asp Lys His Glu
 20 25 30
 Val Leu Ile Lys Val Lys Ala Ala Ser Ile Cys Gly Thr Asp Val His
 35 40 45
 Ile Tyr Asn Trp Asp Gln Trp Ala Arg Gln Arg Ile Lys Thr Pro Tyr
 50 55 60
 Val Phe Gly His Glu Phe Ser Gly Ile Val Glu Gly Val Gly Glu Asn
 65 70 75 80
 Val Ser Ser Val Lys Val Gly Glu Tyr Val Ser Ala Glu Thr His Ile

				85					90					95			
Val	Cys	Gly	Glu	Cys	Val	Pro	Cys	Leu	Thr	Gly	Lys	Ser	His	Val	Cys		
			100					105					110				
Thr	Asn	Thr	Ala	Ile	Ile	Gly	Val	Asp	Thr	Ala	Gly	Cys	Phe	Ala	Glu		
		115					120					125					
Tyr	Val	Lys	Val	Pro	Ala	Asp	Asn	Ile	Trp	Arg	Asn	Pro	Ala	Asp	Met		
	130					135					140						
Asp	Pro	Ser	Ile	Ala	Ser	Ile	Gln	Glu	Pro	Leu	Gly	Asn	Ala	Val	His		
145					150					155					160		
Thr	Val	Leu	Glu	Ser	Gln	Pro	Ala	Gly	Gly	Thr	Thr	Ala	Val	Ile	Gly		
			165						170					175			
Cys	Gly	Pro	Ile	Gly	Leu	Met	Ala	Val	Ala	Val	Ala	Lys	Ala	Ala	Gly		
			180					185					190				
Ala	Ser	Gln	Val	Ile	Ala	Ile	Asp	Lys	Asn	Glu	Tyr	Arg	Leu	Arg	Leu		
		195					200					205					
Ala	Lys	Gln	Met	Gly	Ala	Thr	Cys	Thr	Val	Ser	Ile	Glu	Lys	Glu	Asp		
	210					215					220						
Pro	Leu	Lys	Ile	Val	Ser	Ala	Leu	Thr	Ser	Gly	Glu	Gly	Ala	Asp	Leu		
225					230					235					240		
Val	Cys	Glu	Met	Ser	Gly	His	Pro	Ser	Ala	Ile	Ala	Gln	Gly	Leu	Ala		
				245					250					255			
Met	Ala	Ala	Asn	Gly	Gly	Arg	Phe	His	Ile	Leu	Ser	Leu	Pro	Glu	His		
			260					265					270				
Pro	Val	Thr	Ile	Asp	Leu	Thr	Asn	Lys	Val	Val	Phe	Lys	Gly	Leu	Thr		
		275					280					285					
Ile	Gln	Gly	Ile	Thr	Gly	Arg	Lys	Met	Phe	Ser	Thr	Trp	Arg	Gln	Val		
	290					295					300						
Ser	Gln	Leu	Ile	Ser	Ser	Asn	Met	Ile	Asp	Leu	Ala	Pro	Val	Ile	Thr		
305					310					315					320		
His	Gln	Phe	Pro	Leu	Glu	Glu	Phe	Glu	Lys	Gly	Phe	Glu	Leu	Met	Arg		
			325						330					335			
Ser	Gly	Gln	Cys	Gly	Lys	Val	Ile	Leu	Ile	Pro							
		340						345									

<210> 39

<211> 6127

<212> DNA

<213> Bacillus subtilis

<400> 39

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ctacccaaaa	gaagtctttc	ttttgggttt	atttgttata	tagtatttta	tcctctcatg	180
ccatctttctc	atttctcttg	ccataaggag	tgagagcaat	gaattttcaa	tcaaacattt	240
ccgcattttt	agaggacagc	ttgtcccacc	acacgatacc	gattgtggag	accttcacag	300
tcgatacact	gacacccatt	caaatgatag	agaagcttga	cagggagatt	acgtatcttc	360
ttgaaagcaa	ggacgatata	tccacttggt	ccagatattc	gtttatcggc	ctgaatccat	420
ttctcacaat	taaagaagag	cagggccggt	tttcggccgc	tgatcaggac	agcaaatctc	480
tttacacagg	aaatgaacta	aaagaagtgc	tgaactggat	gaataccaca	tacaaaatca	540
aaacacctga	gcttggcatt	ccttttgtcg	gcggagctgt	cgggtactta	agctatgata	600
tgatcccgtc	gattgagcct	tctgttcctt	cgcataccaa	agaaacagac	atggaaaagt	660
gtatgctggt	tgtttgccgg	acattaattg	cgtatgatca	tgaaacccaa	aacgtccact	720
ttatccaata	tgcaaggctc	actggagagg	aaacaaaaaa	cgaaaaaatg	gatgtattcc	780
atcaaaatca	tctggagctt	caaaatctca	ttgaaaaaat	gatggaccaa	aaaaacataa	840
aagagctggt	tctttctgct	gattcatata	agacaccag	ctttgagaca	gtatcttcta	900
attatgaaaa	atcggtcttt	atggctgatg	tagaaaaaat	caaaagctat	ataaaagcag	960

gcgatatctt	ccaggggtgtt	ttatcacaaa	aatttgaggt	gccgataaaa	gcagatgctt	1020
ttgagttata	ccgagtgcct	aggatcgta	atccttcgcc	gtatatgtat	tatatgaaac	1080
tgctagacag	agaaatagtc	ggcagctctc	cggaacgggt	aatacacgtt	caagacgggc	1140
acttagaaat	ccatccgatt	gccggtacga	gaaaacgcgg	tcagacaaaa	gctgaagatg	1200
agagactgaa	gggttgagctc	atgaaggatg	aaaaagaaaa	agcggagcat	tacatgctcg	1260
ttgatcttgc	ccgaaacgat	atcggcagag	tagcagagta	tggttctgtt	tctgtgccgg	1320
agttcacaaa	aattgtttcc	ttttcacatg	tcatgcacat	tatctcgggtg	gttacaggcc	1380
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tgctgaaaaa	gattcatatt	gcagaagaca	tgtttcatag	caaggaggat	aaagctgatg	1740
aacagatttc	tacaattgtg	cgttgacgga	aaaaccctta	ctgccggtga	ggctgaaacg	1800
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<210> 40
 <211> 801
 <212> DNA
 <213> *Bacillus subtilis*

<400> 40						
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gcttcaaagc	gggcgcttga	tcaaggaatg	aatatcgtaa	aggcaatcga	attaggcgga	240
gaaatgaaaa	aaaacggagt	gaatattccg	attatcctct	ttacgtatta	taatcctgtg	300
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<210> 41
 <211> 267
 <212> PRT
 <213> *Bacillus subtilis*

<400> 41

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			20					25					30		
Ser	Leu	Gln	Lys	Ala	Gly	Ala	Thr	Ala	Leu	Glu	Leu	Gly	Val	Ala	Tyr
		35					40					45			
Ser	Asp	Pro	Leu	Ala	Asp	Gly	Pro	Val	Ile	Gln	Arg	Ala	Ser	Lys	Arg
	50					55					60				
Ala	Leu	Asp	Gln	Gly	Met	Asn	Ile	Val	Lys	Ala	Ile	Glu	Leu	Gly	Gly
65					70					75					80
Glu	Met	Lys	Lys	Asn	Gly	Val	Asn	Ile	Pro	Ile	Ile	Leu	Phe	Thr	Tyr
				85					90					95	
Tyr	Asn	Pro	Val	Leu	Gln	Leu	Asn	Lys	Glu	Tyr	Phe	Phe	Ala	Leu	Leu
			100					105					110		
Arg	Glu	Asn	His	Ile	Asp	Gly	Leu	Leu	Val	Pro	Asp	Leu	Pro	Leu	Glu
		115					120					125			
Glu	Ser	Asn	Ser	Leu	Gln	Glu	Glu	Cys	Lys	Ser	His	Glu	Val	Thr	Tyr
	130					135					140				
Ile	Ser	Leu	Val	Ala	Pro	Thr	Ser	Glu	Ser	Arg	Leu	Lys	Thr	Ile	Ile
145					150					155					160
Glu	Gln	Ala	Glu	Gly	Phe	Val	Tyr	Cys	Val	Ser	Ser	Leu	Gly	Val	Thr
				165					170					175	
Gly	Val	Arg	Asn	Glu	Phe	Asn	Ser	Ser	Val	Tyr	Pro	Phe	Ile	Arg	Thr
			180					185					190		
Val	Lys	Asn	Leu	Ser	Thr	Val	Pro	Val	Ala	Val	Gly	Phe	Gly	Ile	Ser
		195					200					205			
Asn	Arg	Glu	Gln	Val	Ile	Lys	Met	Asn	Glu	Ile	Ser	Asp	Gly	Val	Val
	210					215					220				
Val	Gly	Ser	Ala	Leu	Val	Arg	Lys	Ile	Glu	Glu	Leu	Lys	Asp	Arg	Leu
225					230					235					240
Ile	Ser	Ala	Glu	Thr	Arg	Asn	Gln	Ala	Leu	Gln	Glu	Phe	Glu	Asp	Tyr
				245					250					255	
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<210> 42
 <211> 1195
 <212> DNA
 <213> Bacillus subtilis

<400> 42

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gaagatttaa	accatacagg	ttctcataaa	atcaataatg	cgctaggtca	agcgctgctt	300
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cgtattgaag	gcactatgcc	tgataaagta	gtggcatgtg	taggcggagg	aagcaatgcg	720
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<210> 43
 <211> 400
 <212> PRT
 <213> Bacillus subtilis

<400> 43

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			20					25					30			
Ala	Phe	Lys	Gln	Ile	Lys	Asp	Asp	Pro	Ala	Phe	Arg	Glu	Glu	Tyr	Tyr	
		35					40					45				
Lys	Leu	Leu	Lys	Asp	Tyr	Ser	Gly	Arg	Pro	Thr	Ala	Leu	Thr	Tyr	Ala	
	50					55					60					
Asp	Arg	Val	Thr	Glu	Tyr	Leu	Gly	Gly	Ala	Lys	Ile	Tyr	Leu	Lys	Arg	
65					70					75					80	
Glu	Asp	Leu	Asn	His	Thr	Gly	Ser	His	Lys	Ile	Asn	Asn	Ala	Leu	Gly	
				85					90					95		
Gln	Ala	Leu	Leu	Ala	Lys	Lys	Met	Gly	Lys	Thr	Lys	Ile	Ile	Ala	Glu	
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Thr	Gly	Ala	Gly	Gln	His	Gly	Val	Ala	Ala	Ala	Thr	Val	Ala	Ala	Lys	
	115						120					125				
Phe	Gly	Phe	Ser	Cys	Thr	Val	Phe	Met	Gly	Glu	Glu	Asp	Val	Ala	Arg	
	130					135					140					
Gln	Ser	Leu	Asn	Val	Phe	Arg	Met	Lys	Leu	Leu	Gly	Ala	Glu	Val	Val	
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Pro	Val	Thr	Ser	Gly	Asn	Gly	Thr	Leu	Lys	Asp	Ala	Thr	Asn	Glu	Ala	
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Ile	Arg	Tyr	Trp	Val	Gln	His	Cys	Glu	Asp	His	Phe	Tyr	Met	Ile	Gly	
	180							185					190			
Ser	Val	Val	Gly	Pro	His	Pro	Tyr	Pro	Gln	Val	Val	Arg	Glu	Phe	Gln	
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Lys	Met	Ile	Gly	Glu	Glu	Ala	Lys	Asp	Gln	Leu	Lys	Arg	Ile	Glu	Gly	
	210					215					220					
Thr	Met	Pro	Asp	Lys	Val	Val	Ala	Cys	Val	Gly	Gly	Gly	Ser	Asn	Ala	
225					230					235					240	
Met	Gly	Met	Phe	Gln	Ala	Phe	Leu	Asn	Glu	Asp	Val	Glu	Leu	Ile	Gly	
				245					250					255		
Ala	Glu	Ala	Ala	Gly	Lys	Gly	Ile	Asp	Thr	Pro	Leu	His	Ala	Ala	Thr	
		260						265					270			
Ile	Ser	Lys	Gly	Thr	Val	Gly	Val	Ile	His	Gly	Ser	Leu	Thr	Tyr	Leu	
	275					280						285				
Ile	Gln	Asp	Glu	Phe	Gly	Gln	Ile	Ile	Glu	Pro	Tyr	Ser	Ile	Ser	Ala	
	290					295					300					
Gly	Leu	Asp	Tyr	Pro	Gly	Ile	Gly	Pro	Glu	His	Ala	Tyr	Leu	His	Lys	
305					310					315					320	
Ser	Gly	Arg	Val	Thr	Tyr	Asp	Ser	Ile	Thr	Asp	Glu	Glu	Ala	Val	Asp	
				325					330					335		
Ala	Leu	Lys	Leu	Leu	Ser	Glu	Lys	Glu	Gly	Ile	Leu	Pro	Ala	Ile	Glu	
		340						345					350			
Ser	Ala	His	Ala	Leu	Ala	Lys	Ala	Phe	Lys	Leu	Ala	Lys	Gly	Met	Asp	

	195					200						205							
Ser	Gly	Ile	Gly	Ser	Leu	Glu	His	Leu	Thr	Phe	Val	Asn	Glu	His	Gly				
	210					215					220								
Ala	Arg	Ala	Val	Leu	Ile	Gly	Glu	Ser	Leu	Met	Arg	Gln	Thr	Ser	Gln				
225					230					235					240				
Arg	Lys	Ala	Ile	His	Ala	Leu	Phe	Arg	Glu										
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<210> 46
 <211> 1009
 <212> DNA
 <213> Bacillus subtilis

<400> 46
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 tcaattcttg ctcatcgggg ggagacgcca gaagagcttg cgggttttgt gaaggcaatg 180
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<210> 47
 <211> 338
 <212> PRT
 <213> Bacillus subtilis

<400> 47
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 Gly Glu Ala Glu Thr Leu Met Asn Met Met Met Ala Ala Glu Met Thr
 20 25 30
 Pro Ser Glu Met Gly Gly Ile Leu Ser Ile Leu Ala His Arg Gly Glu
 35 40 45
 Thr Pro Glu Glu Leu Ala Gly Phe Val Lys Ala Met Arg Ala His Ala
 50 55 60
 Leu Thr Val Asp Gly Leu Pro Asp Ile Val Asp Thr Cys Gly Thr Gly
 65 70 75 80
 Gly Asp Gly Ile Ser Thr Phe Asn Ile Ser Thr Ala Ser Ala Ile Val
 85 90 95
 Ala Ser Ala Ala Gly Ala Lys Ile Ala Lys His Gly Asn Arg Ser Val
 100 105 110
 Ser Ser Lys Ser Gly Ser Ala Asp Val Leu Glu Glu Leu Glu Val Ser
 115 120 125
 Ile Gln Thr Thr Pro Glu Lys Val Lys Ser Ser Ile Glu Thr Asn Asn
 130 135 140
 Met Gly Phe Leu Phe Ala Pro Leu Tyr His Ser Ser Met Lys His Val

145		150		155		160
Ala Gly Thr Arg Lys Glu Leu Gly Phe Arg Thr Val Phe Asn Leu Leu						
	165		170			175
Gly Pro Leu Ser Asn Pro Leu Gln Ala Lys Arg Gln Val Ile Gly Val						
	180		185			190
Tyr Ser Val Glu Lys Ala Gly Leu Met Ala Ser Ala Leu Glu Thr Phe						
	195		200			205
Gln Pro Lys His Val Met Phe Val Ser Ser Arg Asp Gly Leu Asp Glu						
	210		215			220
Leu Ser Ile Thr Ala Pro Thr Asp Val Ile Glu Leu Lys Asp Gly Glu						
	225		230			235
Arg Arg Glu Tyr Thr Val Ser Pro Glu Asp Phe Gly Phe Thr Asn Gly						
	245		250			255
Arg Leu Glu Asp Leu Gln Val Gln Ser Pro Lys Glu Ser Ala Tyr Leu						
	260		265			270
Ile Gln Asn Ile Phe Glu Asn Lys Ser Ser Ser Ser Ala Leu Ser Ile						
	275		280			285
Thr Ala Phe Asn Ala Gly Ala Ala Ile Tyr Thr Ala Gly Ile Thr Ala						
	290		295			300
Ser Leu Lys Glu Gly Thr Glu Leu Ala Leu Glu Thr Ile Thr Ser Gly						
	305		310			315
Gly Ala Ala Ala Gln Leu Glu Arg Leu Lys Gln Lys Glu Glu Glu Ile						
	325		330			335
Tyr Ala						

<210> 48
 <211> 1519
 <212> DNA
 <213> Bacillus subtilis

<400> 48	
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ccgattgtgg agaccttcac agtcgataca ctgacaccca ttcaaagtat agagaagctt	120
gacagggaga ttacgtatct tcttgaaagc aaggacgata catccacttg gtccagatat	180
tcgtttatcg gcttgaatcc atttctcaca attaaagaag agcagggccg tttttcggcc	240
gctgatcagg acagcaaate tctttacaca ggaaatgaac taaaagaagt gctgaactgg	300
atgaatacca catacaaaat caaaacacct gagcttggca ttctttttgt cggcggagct	360
gtcgggtact taagctatga tatgatcccg ctgattgagc cttctgttcc ttgcatacc	420
aaagaaacag acatggaaaa gtgtatgctg tttgtttgcc ggacattaat tgcgtatgat	480
catgaaacca aaaacgtcca ctttatccaa tatgcaaggc tcaactggaga ggaaacaaaa	540
aacgaaaaaa tggatgtatt ccatcaaaat catctggagc ttcaaaatct cattgaaaaa	600
atgatggacc aaaaaaacat aaaagagctg tttctttctg ctgattcata caagacaccc	660
agctttgaga cagtatcttc taattatgaa aaatcggctt ttatggctga tgtagaaaaa	720
atcaaaagct atataaaagc aggcgatatc ttccagggtg ttttatcaca aaaatttgag	780
gtgccgataa aagcagatgc ttttgagtta taccgagtgc ttaggatcgt caatccttcg	840
ccgtatatgt atttatatgaa actgctagac agagaaatag tcggcagctc tccggaacgg	900
ttaatacacg ttcaagacgg gcacttagaa atccatccga ttgccggtac gagaaaacgc	960
ggtgcagaca aagctgaaga tgagagactg aaggttgagc tcatgaagga tgaaaaagaa	1020
aaagcggagc attacatgct cgttgatctt gcccgaaacg atatcggcag agtagcagag	1080
tatggttctg tttctgtgcc ggagttcaca aaaattgttt ccttttcaca tgtcatgcac	1140
attatctcgg tggttacagg ccgattgaaa aaaggggttc atcctgtcga tgcactgatg	1200
tctgctttcc cggcggggac tttaacaggc gcacccaaaa tccgtgccat gcagcttttg	1260
caagaactcg agccaacacc gagagagaca tacggagggt gtattgccta cattgggttt	1320
gacgggaata tcgactcttg tattacgatt cgcacgatga gtgtaaagaa cgggtgttgca	1380
tcgatacagg caggtgctgg cattgttgct gattctgttc cggaagccga atacgaagaa	1440
agctgtaata aagccgggtgc gctgctgaaa acgattcata ttgcagaaga catgtttcat	1500

agcaaggagg ataaagctg

1519

<210> 49
<211> 515
<212> PRT
<213> Bacillus subtilis

<400> 49
Met Asn Phe Gln Ser Asn Ile Ser Ala Phe Leu Glu Asp Ser Leu Ser
1 5 10 15
His His Thr Ile Pro Ile Val Glu Thr Phe Thr Val Asp Thr Leu Thr
20 25 30
Pro Ile Gln Met Ile Glu Lys Leu Asp Arg Glu Ile Thr Tyr Leu Leu
35 40 45
Glu Ser Lys Asp Asp Thr Ser Thr Trp Ser Arg Tyr Ser Phe Ile Gly
50 55 60
Leu Asn Pro Phe Leu Thr Ile Lys Glu Glu Gln Gly Arg Phe Ser Ala
65 70 75 80
Ala Asp Gln Asp Ser Lys Ser Leu Tyr Thr Gly Asn Glu Leu Lys Glu
85 90 95
Val Leu Asn Trp Met Asn Thr Thr Tyr Lys Ile Lys Thr Pro Glu Leu
100 105 110
Gly Ile Pro Phe Val Gly Gly Ala Val Gly Tyr Leu Ser Tyr Asp Met
115 120 125
Ile Pro Leu Ile Glu Pro Ser Val Pro Ser His Thr Lys Glu Thr Asp
130 135 140
Met Glu Lys Cys Met Leu Phe Val Cys Arg Thr Leu Ile Ala Tyr Asp
145 150 155 160
His Glu Thr Lys Asn Val His Phe Ile Gln Tyr Ala Arg Leu Thr Gly
165 170 175
Glu Glu Thr Lys Asn Glu Lys Met Asp Val Phe His Gln Asn His Leu
180 185 190
Glu Leu Gln Asn Leu Ile Glu Lys Met Met Asp Gln Lys Asn Ile Lys
195 200 205
Glu Leu Phe Leu Ser Ala Asp Ser Tyr Lys Thr Pro Ser Phe Glu Thr
210 215 220
Val Ser Ser Asn Tyr Glu Lys Ser Ala Phe Met Ala Asp Val Glu Lys
225 230 235 240
Ile Lys Ser Tyr Ile Lys Ala Gly Asp Ile Phe Gln Gly Val Leu Ser
245 250 255
Gln Lys Phe Glu Val Pro Ile Lys Ala Asp Ala Phe Glu Leu Tyr Arg
260 265 270
Val Leu Arg Ile Val Asn Pro Ser Pro Tyr Met Tyr Tyr Met Lys Leu
275 280 285
Leu Asp Arg Glu Ile Val Gly Ser Ser Pro Glu Arg Leu Ile His Val
290 295 300
Gln Asp Gly His Leu Glu Ile His Pro Ile Ala Gly Thr Arg Lys Arg
305 310 315 320
Gly Ala Asp Lys Ala Glu Asp Glu Arg Leu Lys Val Glu Leu Met Lys
325 330 335
Asp Glu Lys Glu Lys Ala Glu His Tyr Met Leu Val Asp Leu Ala Arg
340 345 350
Asn Asp Ile Gly Arg Val Ala Glu Tyr Gly Ser Val Ser Val Pro Glu
355 360 365
Phe Thr Lys Ile Val Ser Phe Ser His Val Met His Ile Ile Ser Val
370 375 380
Val Thr Gly Arg Leu Lys Lys Gly Val His Pro Val Asp Ala Leu Met

	115		120		125										
Ile	Asp	Ser	Ser	Val	Lys	Gly	Ser	Arg	Gly	Gly	Thr	Gly	Val	Ala	Phe
	130					135					140				
Ser	Trp	Asp	Cys	Val	Pro	Glu	Tyr	Gln	Gln	Ala	Ala	Ile	Gly	Lys	Arg
145					150					155					160
Cys	Phe	Ile	Ala	Gly	Gly	Val	Asn	Pro	Asp	Ser	Ile	Thr	Arg	Leu	Leu
				165					170					175	
Lys	Trp	Gln	Pro	Glu	Gly	Ile	Asp	Leu	Ala	Ser	Gly	Ile	Glu	Lys	Asn
			180					185					190		
Gly	Gln	Lys	Asp	Gln	Asn	Leu	Met	Arg	Leu	Leu	Glu	Glu	Arg	Met	Asn
	195						200					205			
Arg	Tyr	Val	Ser	Ile	Ser	Glu									
	210					215									

<210> 52
 <211> 909
 <212> DNA
 <213> Bacillus subtilis

<400> 52
 gtgatcacaa gagatTTTTT cttatTTTTt tccaaaagcg gctttctcaa taaaatggcg 60
 aggaactggg gaagtcgggt agcagcgggt aaaattatcg gcgggaatga ctttaacagt 120
 tcaatcccga ccattcgaca gcttaacagc caaggcttgt cagttactgt cgatcattta 180
 ggcgagtttg tgaacagcgc cgaggtcgca cgggagcgta cggaagagtg cattcaaacc 240
 attgcgacca tcgcggatca ggagctgaac tcacacgttt ctttaaaaaat gacgtcttta 300
 ggtttgata tagatatgga tttggtgtat gaaaaatatga caaaaatcct tcagacggcc 360
 gagaaacata aaatcatggt caccattgac atggaggacg aagtcagatg ccagaaaacg 420
 cttgatattt tcaaagattt cagaaagaaa tacgagcatg tgagcacagt gctgcaagcc 480
 tatctgtacc ggacggaaaa agacattgac gatttggatt ctttaaaccg gttccttcgc 540
 cttgtaaaag gagcttataa agaatcagaa aaagtagctt tcccggagaa aagcgatgtc 600
 gatgaaaatt acaaaaaaat catccgaaag cagctcttaa acggtcacta tacagcgatt 660
 gccacacatg acgacaaaat gatcgacttt acaaagcagc ttgccaaagga acatggcatt 720
 gccaatgaca agtttgaatt tcagatgctg tacggcatgc ggtcgcaaac ccagctcagc 780
 ctcgtaaaag aaggttataa catgagagtc tacctgccat acggcgagga ttggtacggc 840
 tactttatga gacgccttgc agaacgtccg tcaaacattg catttgcttt caaaggaatg 900
 acaaagaag 909

<210> 53
 <211> 303
 <212> PRT
 <213> Bacillus subtilis

<400> 53
 Met Ile Thr Arg Asp Phe Phe Leu Phe Leu Ser Lys Ser Gly Phe Leu
 1 5 10 15
 Asn Lys Met Ala Arg Asn Trp Gly Ser Arg Val Ala Ala Gly Lys Ile
 20 25 30
 Ile Gly Gly Asn Asp Phe Asn Ser Ile Pro Thr Ile Arg Gln Leu
 35 40 45
 Asn Ser Gln Gly Leu Ser Val Thr Val Asp His Leu Gly Glu Phe Val
 50 55 60
 Asn Ser Ala Glu Val Ala Arg Glu Arg Thr Glu Glu Cys Ile Gln Thr
 65 70 75 80
 Ile Ala Thr Ile Ala Asp Gln Glu Leu Asn Ser His Val Ser Leu Lys
 85 90 95
 Met Thr Ser Leu Gly Leu Asp Ile Asp Met Asp Leu Val Tyr Glu Asn
 100 105 110

Met	Thr	Lys	Ile	Leu	Gln	Thr	Ala	Glu	Lys	His	Lys	Ile	Met	Val	Thr
		115					120					125			
Ile	Asp	Met	Glu	Asp	Glu	Val	Arg	Cys	Gln	Lys	Thr	Leu	Asp	Ile	Phe
	130					135					140				
Lys	Asp	Phe	Arg	Lys	Lys	Tyr	Glu	His	Val	Ser	Thr	Val	Leu	Gln	Ala
145				150						155					160
Tyr	Leu	Tyr	Arg	Thr	Glu	Lys	Asp	Ile	Asp	Asp	Leu	Asp	Ser	Leu	Asn
			165						170					175	
Pro	Phe	Leu	Arg	Leu	Val	Lys	Gly	Ala	Tyr	Lys	Glu	Ser	Glu	Lys	Val
		180						185					190		
Ala	Phe	Pro	Glu	Lys	Ser	Asp	Val	Asp	Glu	Asn	Tyr	Lys	Lys	Ile	Ile
		195					200					205			
Arg	Lys	Gln	Leu	Leu	Asn	Gly	His	Tyr	Thr	Ala	Ile	Ala	Thr	His	Asp
	210					215					220				
Asp	Lys	Met	Ile	Asp	Phe	Thr	Lys	Gln	Leu	Ala	Lys	Glu	His	Gly	Ile
225				230						235					240
Ala	Asn	Asp	Lys	Phe	Glu	Phe	Gln	Met	Leu	Tyr	Gly	Met	Arg	Ser	Gln
			245						250					255	
Thr	Gln	Leu	Ser	Leu	Val	Lys	Glu	Gly	Tyr	Asn	Met	Arg	Val	Tyr	Leu
		260						265					270		
Pro	Tyr	Gly	Glu	Asp	Trp	Tyr	Gly	Tyr	Phe	Met	Arg	Arg	Leu	Ala	Glu
		275					280					285			
Arg	Pro	Ser	Asn	Ile	Ala	Phe	Ala	Phe	Lys	Gly	Met	Thr	Lys	Lys	
	290					295					300				

<210> 54
 <211> 1545
 <212> DNA
 <213> Bacillus subtilis

<400> 54	
atgacaacac cttacaaaca cgagccattc acaaatttcc aagatcaaaa ctacgtggaa	60
gcgttttaaaa aagcgcttgc gacagtaagc gaatatattag gaaaagacta tccgcttgtc	120
attaacggcg agagagtggg aacggaagcg aaaatcgttt caatcaaccc agctgataaa	180
gaagaagtgc tggcgagagt gtcaaaagcg tctcaagagc acgctgagca agcgattcaa	240
gcggctgcaa aagcatttga agagtggaga tacacgtctc ctgaagagag agcggctgtc	300
ctgttccgcg ctgctgccaa agtccgcaga agaaaacatg aattctcagc tttgcttggtg	360
aaagaagcag gaaagccttg gaacgagggc gatgccgata cggctgaagc gattgacttc	420
atggagtatt atgcacgcca aatgatcgaa ctggcaaaaag gcaaaccggt caacagccgt	480
gaaggcgaga aaaaccaata tgtatacacg ccgactggag tgacagtcgt tatccgcct	540
tggaacttct tgtttgcgat catggcaggc acaacagtg cgccgatcgt tactggaaac	600
acagtgggtc tgaaacctgc gagtgtctaca cctgttattg cagcaaaatt tggtgaggtg	660
cttgaagagt cgggattgcc aaaaggcgta gtcaactttg ttccgggaag cggatcggaa	720
gtaggcgact atcttgttga ccatccgaaa acaagcctta tcacatttac gggatcaaga	780
gaagttggta cgagaatttt cgaacgcgcg gcgaagggtc agccggggcca gcagcattta	840
aagcgtgtca tcgctgaaat gggcggtaaa gatacgggtt ttggtgatga ggatgcggac	900
attgaattag cggctcaatc gatctttact tcagcattcg gctttgcggg acaaaaatgc	960
tctgcagggt cagctgcagt agttcatgaa aaagtgtatg atcaagtatt agagcgtgtc	1020
attgaaatta cggaatcaaa agtaacagct aaacctgaca gtgcagatgt ttatatggga	1080
cctgtcattg accaaggttc ttatgataaa attatgagct atattgagat cggaaaacag	1140
gaaggcggtt tagtaagcgg cgggtactggt gatgattcga aaggatactt catcaaaccg	1200
acgatcttcg ctgaccttga tccgaaagca agactcatgc aggaagaaat tttcggacct	1260
gtcgttgcat tttgtaaagt gtcagacttt gatgaagctt tagaagtggc aaacaatact	1320
gaatatgggt tgacaggcgc ggttatcaca aacaaccgca agcacatcga gcgtgcgaaa	1380
caggaattcc atgtcggaaa cctatacttc aaccgcaact gtacaggtgc tatcgtcggc	1440
taccatccgt ttggcggtt caaaatgtcg ggaacggatt caaaagcagg cgggcccggat	1500
tacttggctc tgcatatgca agcaaaaaca atcagtgaat tggttc	1545

<210> 55
 <211> 515
 <212> PRT
 <213> Bacillus subtilis

<400> 55
 Met Thr Thr Pro Tyr Lys His Glu Pro Phe Thr Asn Phe Gln Asp Gln
 1 5 10 15
 Asn Tyr Val Glu Ala Phe Lys Lys Ala Leu Ala Thr Val Ser Glu Tyr
 20 25 30
 Leu Gly Lys Asp Tyr Pro Leu Val Ile Asn Gly Glu Arg Val Glu Thr
 35 40 45
 Glu Ala Lys Ile Val Ser Ile Asn Pro Ala Asp Lys Glu Glu Val Val
 50 55 60
 Gly Arg Val Ser Lys Ala Ser Gln Glu His Ala Glu Gln Ala Ile Gln
 65 70 75 80
 Ala Ala Ala Lys Ala Phe Glu Glu Trp Arg Tyr Thr Ser Pro Glu Glu
 85 90 95
 Arg Ala Ala Val Leu Phe Arg Ala Ala Ala Lys Val Arg Arg Arg Lys
 100 105 110
 His Glu Phe Ser Ala Leu Leu Val Lys Glu Ala Gly Lys Pro Trp Asn
 115 120 125
 Glu Ala Asp Ala Asp Thr Ala Glu Ala Ile Asp Phe Met Glu Tyr Tyr
 130 135 140
 Ala Arg Gln Met Ile Glu Leu Ala Lys Gly Lys Pro Val Asn Ser Arg
 145 150 155 160
 Glu Gly Glu Lys Asn Gln Tyr Val Tyr Thr Pro Thr Gly Val Thr Val
 165 170 175
 Val Ile Pro Pro Trp Asn Phe Leu Phe Ala Ile Met Ala Gly Thr Thr
 180 185 190
 Val Ala Pro Ile Val Thr Gly Asn Thr Val Val Leu Lys Pro Ala Ser
 195 200 205
 Ala Thr Pro Val Ile Ala Ala Lys Phe Val Glu Val Leu Glu Glu Ser
 210 215 220
 Gly Leu Pro Lys Gly Val Val Asn Phe Val Pro Gly Ser Gly Ser Glu
 225 230 235 240
 Val Gly Asp Tyr Leu Val Asp His Pro Lys Thr Ser Leu Ile Thr Phe
 245 250 255
 Thr Gly Ser Arg Glu Val Gly Thr Arg Ile Phe Glu Arg Ala Ala Lys
 260 265 270
 Val Gln Pro Gly Gln Gln His Leu Lys Arg Val Ile Ala Glu Met Gly
 275 280 285
 Gly Lys Asp Thr Val Val Val Asp Glu Asp Ala Asp Ile Glu Leu Ala
 290 295 300
 Ala Gln Ser Ile Phe Thr Ser Ala Phe Gly Phe Ala Gly Gln Lys Cys
 305 310 315 320
 Ser Ala Gly Ser Arg Ala Val Val His Glu Lys Val Tyr Asp Gln Val
 325 330 335
 Leu Glu Arg Val Ile Glu Ile Thr Glu Ser Lys Val Thr Ala Lys Pro
 340 345 350
 Asp Ser Ala Asp Val Tyr Met Gly Pro Val Ile Asp Gln Gly Ser Tyr
 355 360 365
 Asp Lys Ile Met Ser Tyr Ile Glu Ile Gly Lys Gln Glu Gly Arg Leu
 370 375 380
 Val Ser Gly Gly Thr Gly Asp Asp Ser Lys Gly Tyr Phe Ile Lys Pro
 385 390 395 400

Thr Ile Phe Ala Asp Leu Asp Pro Lys Ala Arg Leu Met Gln Glu Glu
 405 410 415
 Ile Phe Gly Pro Val Val Ala Phe Cys Lys Val Ser Asp Phe Asp Glu
 420 425 430
 Ala Leu Glu Val Ala Asn Asn Thr Glu Tyr Gly Leu Thr Gly Ala Val
 435 440 445
 Ile Thr Asn Asn Arg Lys His Ile Glu Arg Ala Lys Gln Glu Phe His
 450 455 460
 Val Gly Asn Leu Tyr Phe Asn Arg Asn Cys Thr Gly Ala Ile Val Gly
 465 470 475 480
 Tyr His Pro Phe Gly Phe Lys Met Ser Gly Thr Asp Ser Lys Ala
 485 490 495
 Gly Gly Pro Asp Tyr Leu Ala Leu His Met Gln Ala Lys Thr Ile Ser
 500 505 510
 Glu Met Phe
 515

<210> 56
 <211> 762
 <212> DNA
 <213> Bacillus subtilis

<400> 56
 atgcaatcct tgaattatga agatcaggtg ctttggacgc gctggaaaga gtggaaagat 60
 cctaaagccg gtgacgactt aatgcgccgt tacatgccgc ttgtcacata tcatgtaggc 120
 agaattttctg tcggactgcc gaaatcagtg cataaagacg atcttatgag ccttggtatg 180
 cttggtttat atgatgccct tgaaaaattht gaccccagcc gggacttaaa atttgatacc 240
 tacgcctcgt ttagaattcg cggcgcaatc atagacgggc ttcgtaaaga agattggctg 300
 cccagaacct cgcgcgaaaa aacaaaaaag gttgaagcag caattgaaaa gcttgaacag 360
 cggtatcttc ggaatgtatc gccgcgggaa attgcagagg aactcggaat gacggtacag 420
 gatgtcgtgt caacaatgaa tgaaggthtt tttgcaaata tgctgtcaat tgatgaaaag 480
 ctccatgata aagatgacgg gaaaaacatt caagtcatga tcagagatga caaaaatggt 540
 ccgcctgaag aaaagattat gaaggatgaa ctgattgcac agcttgcgga aaaaattcac 600
 gaactctctg aaaaagaaca gctggttgct agtttgthct acaaagagga gttgacactg 660
 acagaaatcg gacaagtatt aaatctthct acgtcccgca tatctcagat ccattcaaag 720
 gcattattta aattaaagaa tctgctggaa aaagtgatac aa 762

<210> 57
 <211> 254
 <212> PRT
 <213> Bacillus subtilis

<400> 57
 Met Gln Ser Leu Asn Tyr Glu Asp Gln Val Leu Trp Thr Arg Trp Lys
 1 5 10 15
 Glu Trp Lys Asp Pro Lys Ala Gly Asp Asp Leu Met Arg Arg Tyr Met
 20 25 30
 Pro Leu Val Thr Tyr His Val Gly Arg Ile Ser Val Gly Leu Pro Lys
 35 40 45
 Ser Val His Lys Asp Asp Leu Met Ser Leu Gly Met Leu Gly Leu Tyr
 50 55 60
 Asp Ala Leu Glu Lys Phe Asp Pro Ser Arg Asp Leu Lys Phe Asp Thr
 65 70 75 80
 Tyr Ala Ser Phe Arg Ile Arg Gly Ala Ile Ile Asp Gly Leu Arg Lys
 85 90 95
 Glu Asp Trp Leu Pro Arg Thr Ser Arg Glu Lys Thr Lys Lys Val Glu
 100 105 110

Ala	Ala	Ile	Glu	Lys	Leu	Glu	Gln	Arg	Tyr	Leu	Arg	Asn	Val	Ser	Pro
	115						120					125			
Ala	Glu	Ile	Ala	Glu	Glu	Leu	Gly	Met	Thr	Val	Gln	Asp	Val	Val	Ser
	130					135					140				
Thr	Met	Asn	Glu	Gly	Phe	Phe	Ala	Asn	Leu	Leu	Ser	Ile	Asp	Glu	Lys
145				150						155					160
Leu	His	Asp	Gln	Asp	Asp	Gly	Glu	Asn	Ile	Gln	Val	Met	Ile	Arg	Asp
			165					170					175		
Asp	Lys	Asn	Val	Pro	Pro	Glu	Glu	Lys	Ile	Met	Lys	Asp	Glu	Leu	Ile
		180						185					190		
Ala	Gln	Leu	Ala	Glu	Lys	Ile	His	Glu	Leu	Ser	Glu	Lys	Glu	Gln	Leu
	195					200					205				
Val	Val	Ser	Leu	Phe	Tyr	Lys	Glu	Glu	Leu	Thr	Leu	Thr	Glu	Ile	Gly
	210					215					220				
Gln	Val	Leu	Asn	Leu	Ser	Thr	Ser	Arg	Ile	Ser	Gln	Ile	His	Ser	Lys
225				230						235					240
Ala	Leu	Phe	Lys	Leu	Lys	Asn	Leu	Leu	Glu	Lys	Val	Ile	Gln		
			245						250						

<210> 58
 <211> 602
 <212> DNA
 <213> Bacillus licheniformis

<400> 58	
atgaattttc aaacaatcga gcttgacaca tggatatagaa aatcttattt tgaccattac	60
atgaaggaag cgaaatgttc tttcagcatc acggcaaacg tcaatgtgac aaatttgctc	120
gccgtgctca agaaaaagaa gctcaagctg tatccggctt ttatttatat cgtatcaagg	180
gtcattcatt cgcgccttga gtttagaaca acgtttgatg acaaaggaag ctgggttatt	240
gggaacaaat gcatccgtgc tatgcgattt ttcatcagga cgaccaaacg ttttccgccc	300
tctggacgga atactcagac gatttttcgc agttttatca tcaatatctt ctggacgccg	360
agcgcttttg agacaaaagg ggcctttggg ctaagccgga catcccgccc aatacgtttt	420
cagttttctt tattccatgg gtgcgctttt caacattcaa tttaaaccctt gataacagcg	480
aacacttgct gccgattatt acaaacggga aatacttttc agaaggcagg gaaacatttt	540
tgcccgtttc ctgcaagtgc accatgcagt gtgtgacggc tatcatgccg gcgcttttat	600
aa	602

<210> 59
 <211> 200
 <212> PRT
 <213> Bacillus licheniformis

<400> 59	
Met Asn Phe Gln Thr Ile Glu Leu Asp Thr Trp Tyr Arg Lys Ser Tyr	
1 5 10 15	
Phe Asp His Tyr Met Lys Glu Ala Lys Cys Ser Phe Ser Ile Thr Ala	
20 25 30	
Asn Val Asn Val Thr Asn Leu Leu Ala Val Leu Lys Lys Lys Leu	
35 40 45	
Lys Leu Tyr Pro Ala Phe Ile Tyr Ile Val Ser Arg Val Ile His Ser	
50 55 60	
Arg Pro Glu Phe Arg Thr Thr Phe Asp Asp Lys Gly Gln Leu Gly Tyr	
65 70 75 80	
Trp Glu Gln Met His Pro Cys Tyr Ala Ile Phe His Gln Asp Asp Gln	
85 90 95	
Thr Phe Ser Ala Leu Trp Thr Glu Tyr Ser Asp Asp Phe Ser Gln Phe	
100 105 110	

Tyr His Gln Tyr Leu Leu Asp Ala Glu Arg Phe Gly Asp Lys Arg Gly
 115 120 125
 Leu Trp Ala Lys Pro Asp Ile Pro Pro Asn Thr Phe Ser Val Ser Ser
 130 135 140
 Ile Pro Trp Val Arg Phe Ser Thr Phe Asn Leu Asn Leu Asp Asn Ser
 145 150 155 160
 Glu His Leu Leu Pro Ile Ile Thr Asn Gly Lys Tyr Phe Ser Glu Gly
 165 170 175
 Arg Glu Thr Phe Leu Pro Val Ser Cys Lys Phe Thr Met Gln Cys Val
 180 185 190
 Thr Ala Ile Met Pro Ala Leu Leu
 195 200

<210> 60
 <211> 39
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> primer

<400> 60
 ctacattcta gacgatttgt ttgatcgata tgtggaagc 39

<210> 61
 <211> 37
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> primer

<400> 61
 ggctgaggat ccattcctca gcccagaaga gaaccta 37

<210> 62
 <211> 38
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> primer

<400> 62
 tccctcggat ccgaaatagg ttctgcttat tgtattcg 38

<210> 63
 <211> 38
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> primer

<400> 63
 agcgttgagc tcgcgccatg ccattatatt ggctgctg 38

<210> 64
 <211> 38
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 64
 gtgacggaat tccacgtgcg tcttatattg ctgagctt 38

 <210> 65
 <211> 38
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 65
 cgttttggat ccaaaaacac ccctttagat aatcttat 38

 <210> 66
 <211> 40
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 66
 atcaaaggat ccgctatgct ccaaattgtac acctttccgt 40

 <210> 67
 <211> 39
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 67
 atatttctgc aggctgatat aaataatact gtgtgttcc 39

 <210> 68
 <211> 37
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 68
 catcttgaat tcaaagggtg caagcacaga gacagag 37

 <210> 69
 <211> 37

<212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 69
 tgacttggat ccggttaagtg ggcagtttgt gggcagt 37

 <210> 70
 <211> 37
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 70
 tagataggat cctattgaaa actgtttaag aagagga 37

 <210> 71
 <211> 37
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 71
 ctgattctgc aggagtgttt ttgaaggaag cttcatt 37

 <210> 72
 <211> 37
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 72
 ctccgcggta ccgtcacgaa tgcgcctctt attctat 37

 <210> 73
 <211> 38
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 73
 tcgctgggat ccttggcgcc gtggaatcga ttttgtcc 38

 <210> 74
 <211> 37
 <212> DNA
 <213> Artificial Sequence

<220>
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<400> 74
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